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Zhao et al.

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(54) **ELECTRICAL CONNECTOR WITH SEALING MEMBER FORMED AFTER MOUNTING UPON PRINTED CIRCUIT BOARD**

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(51) **Int. Cl.**
H01R 43/00 (2006.01)
H01R 13/52 (2006.01)
(Continued)

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CPC ***H01R 43/005*** (2013.01); ***H01R 12/707*** (2013.01); ***H01R 13/521*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H01R 13/658; H01R 13/65802; H01R 13/6581–6597; H01R 13/5202;
(Continued)

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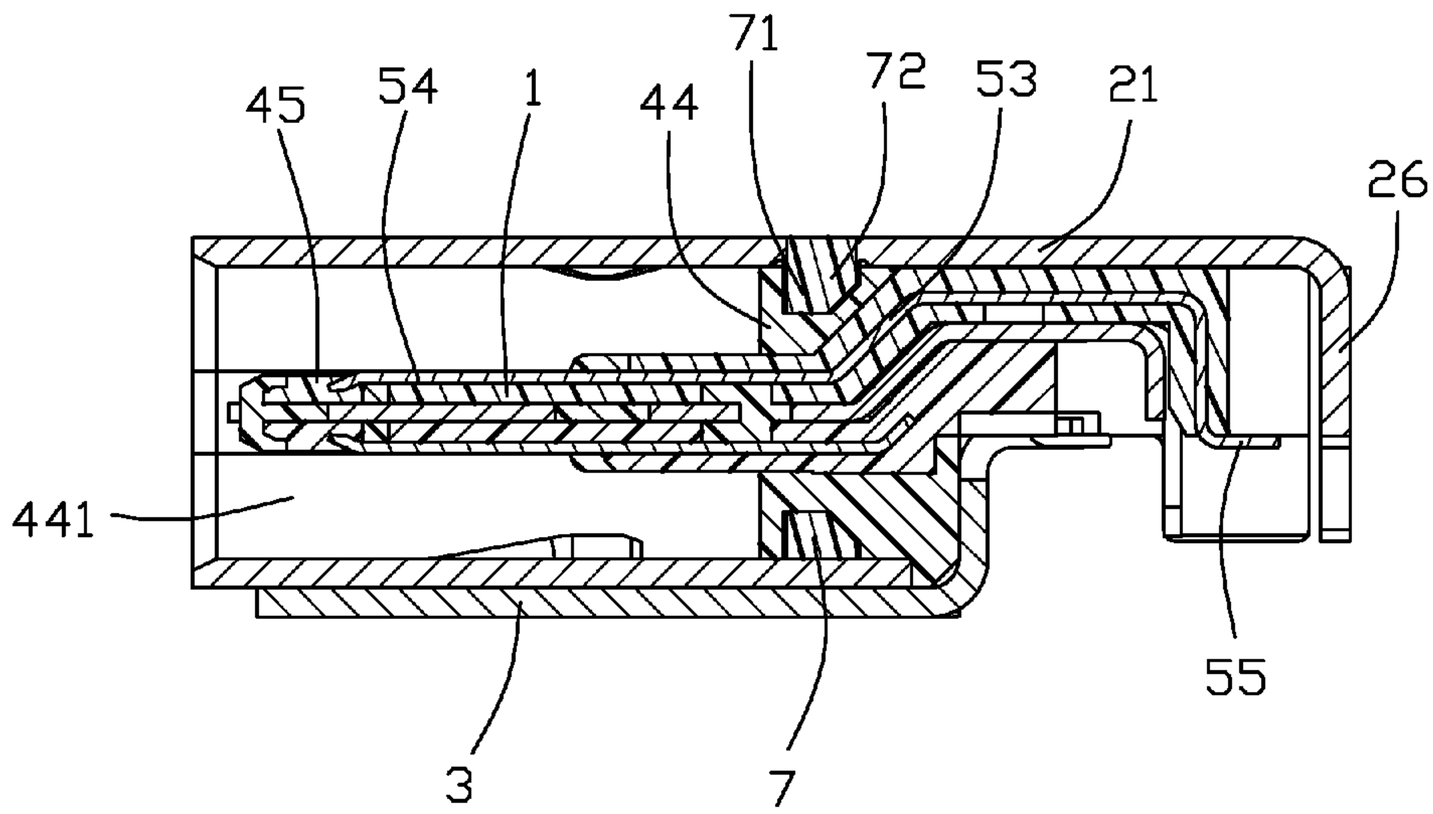
(74) *Attorney, Agent, or Firm* — Wei Te Chung; Ming Chieh Chang

(57) **ABSTRACT**

A electrical connector includes a terminal module and a metallic shell receiving the terminal module. The terminal module includes an insulative housing and a plurality of terminals retained in the housing. The housing includes a base intimately enclosed within the shell, and a tongue extending forwardly from the base. The contact includes a front contacting section, a rear soldering section and a middle retaining section therebetween. The base forms in a peripheral surface a circumferential or race course like groove which is isolated from an exterior along a front-to-back direction, and the shell forms an upward opening in a top wall and downwardly communicates with the groove so as to inject the glue into the groove through the opening to form the glue structure only after the connector is soldered upon the printed circuit board.

20 Claims, 26 Drawing Sheets



(51) **Int. Cl.**

H01R 12/70	(2011.01)
H01R 13/6585	(2011.01)
H01R 43/20	(2006.01)
H01R 107/00	(2006.01)
H01R 24/60	(2011.01)

(52) **U.S. Cl.**
CPC ***H01R 13/5202*** (2013.01); ***H01R 13/6585*** (2013.01); ***H01R 43/205*** (2013.01); *H01R 24/60* (2013.01); *H01R 2107/00* (2013.01)

(58) **Field of Classification Search**
CPC .. H01R 13/521; H01R 43/005; H01R 43/205; H01R 24/60; H01R 2107/00; H01R 12/707
USPC 439/607.01–607.58
See application file for complete search history.

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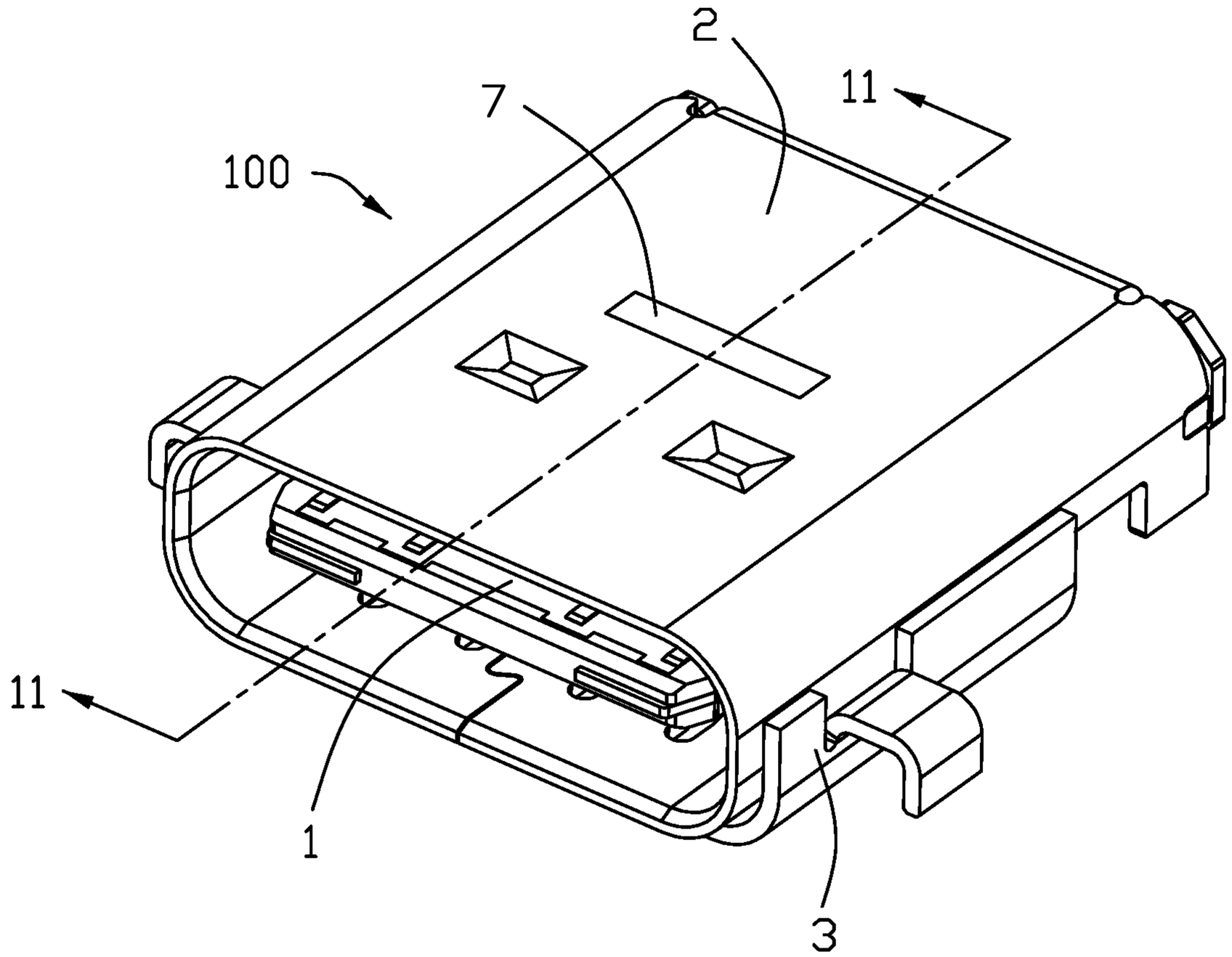

FIG. 1

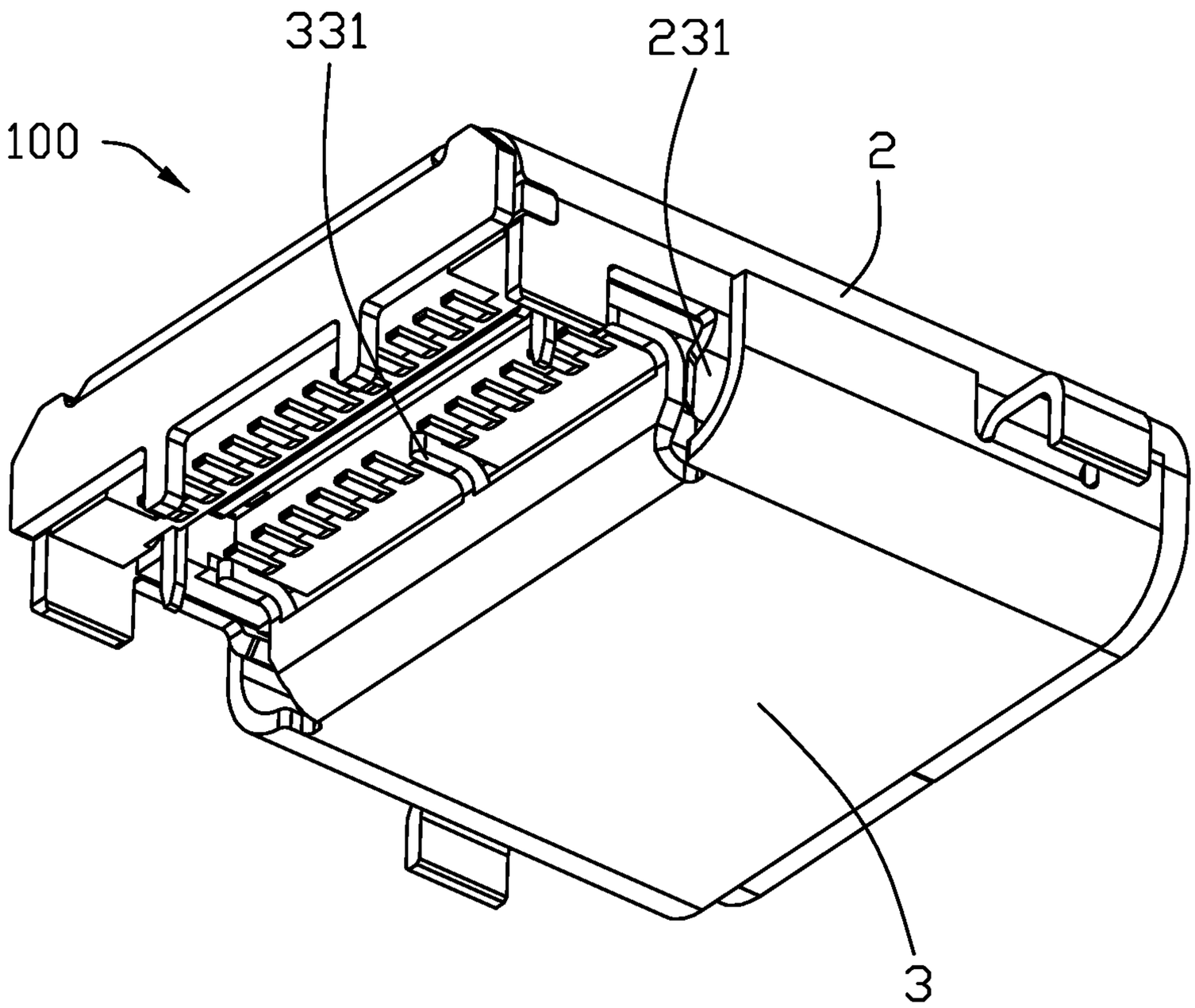

FIG. 2

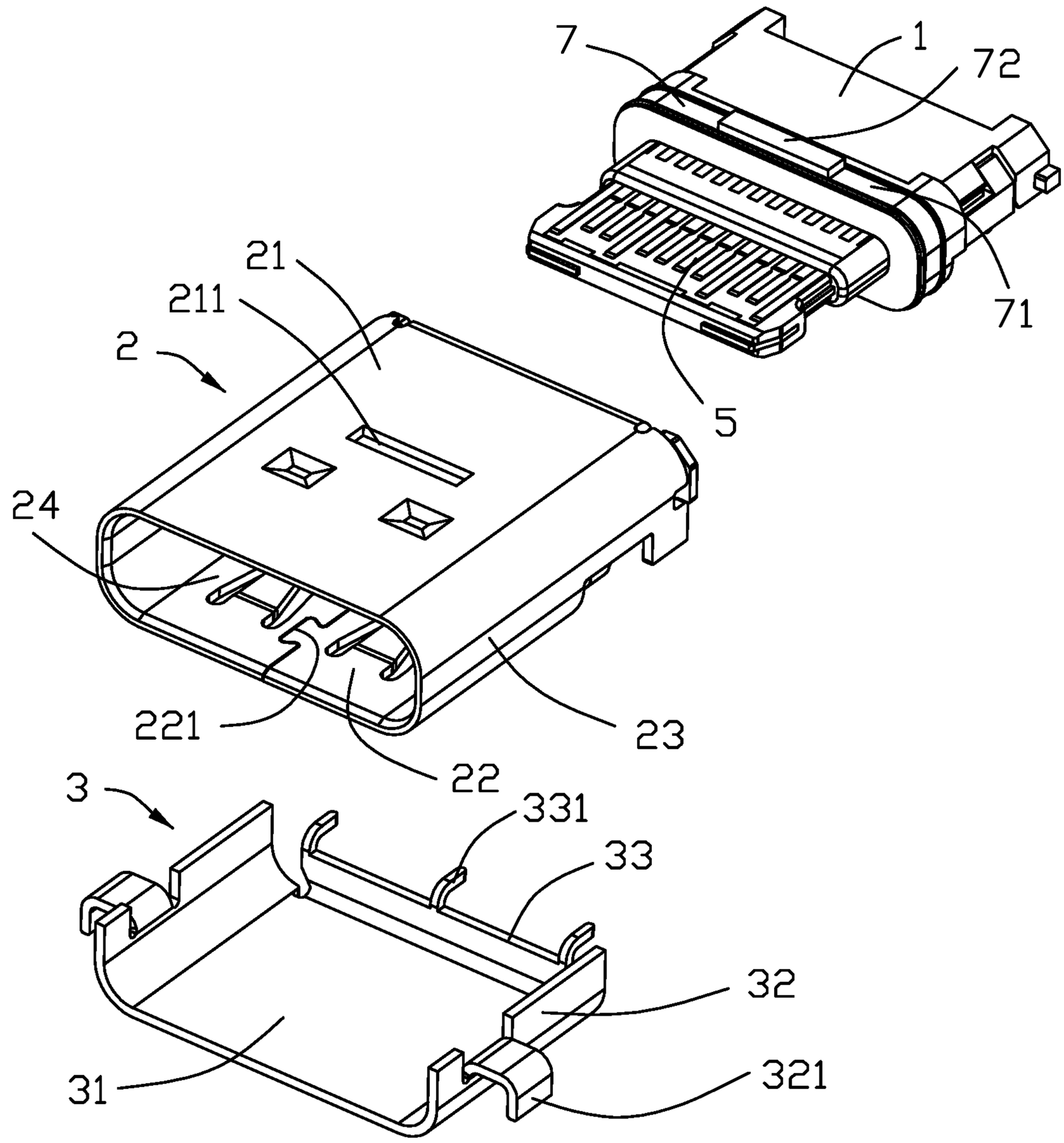

FIG. 3

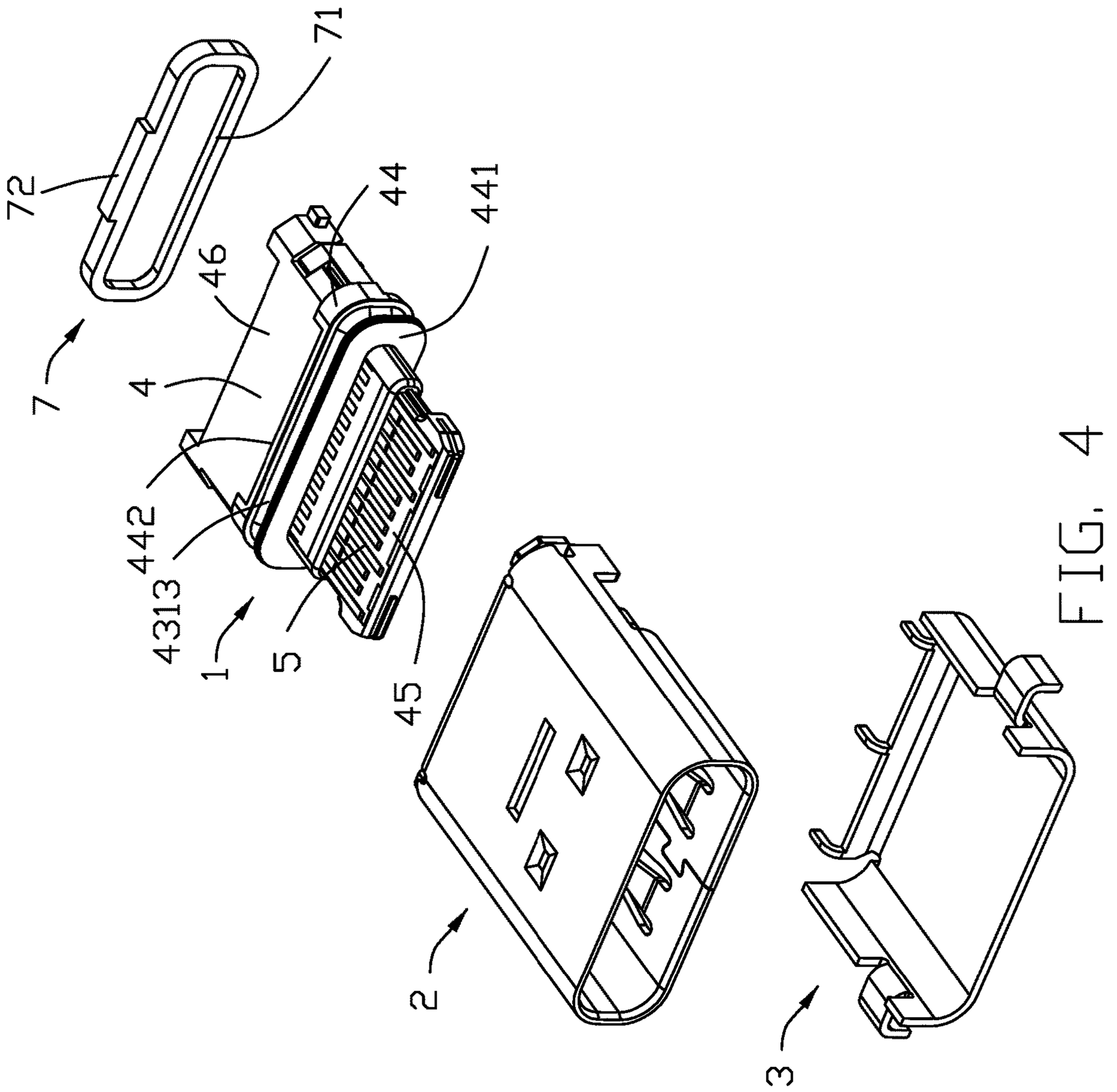

FIG. 4

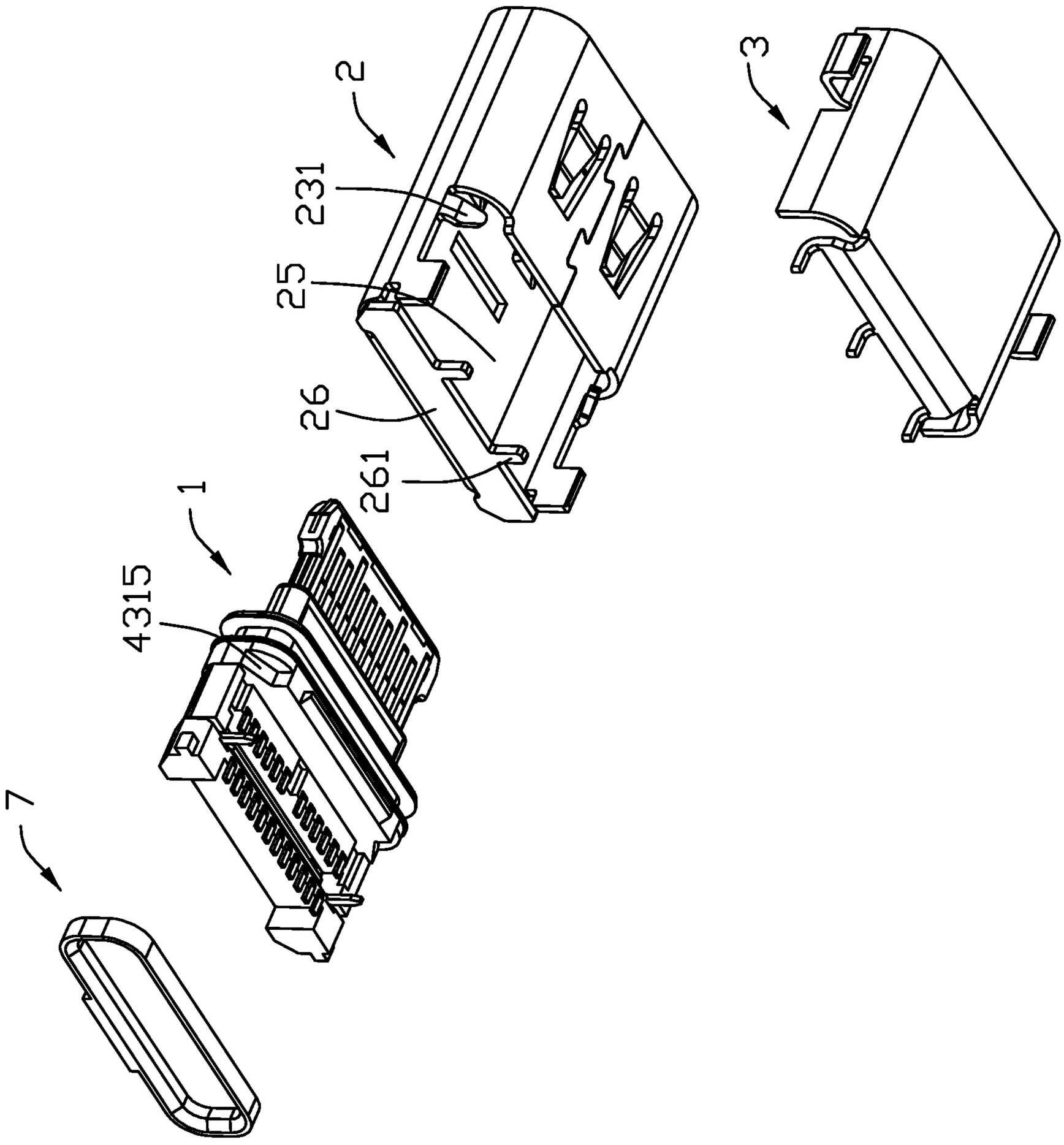

FIG. 5

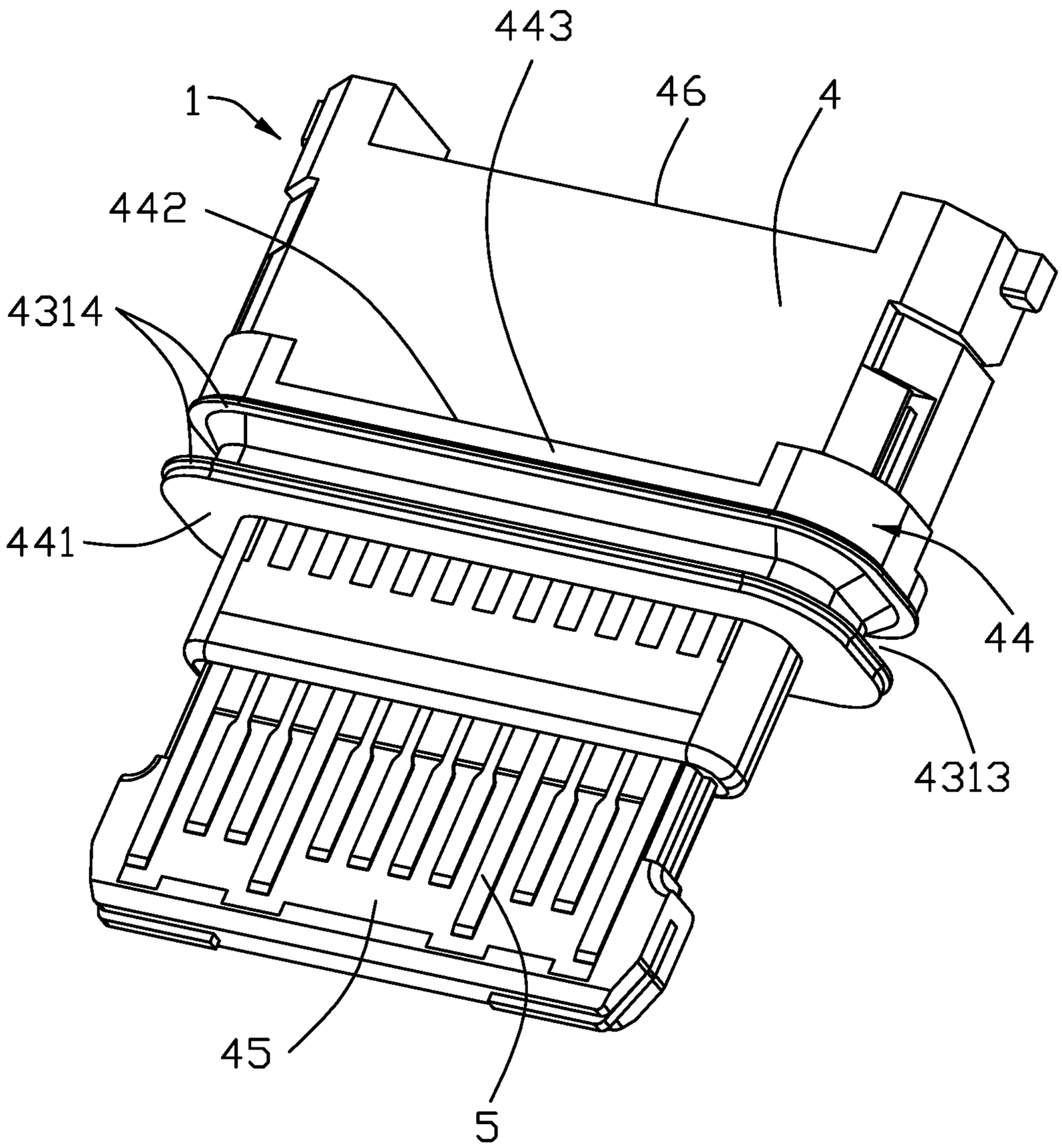

FIG. 6

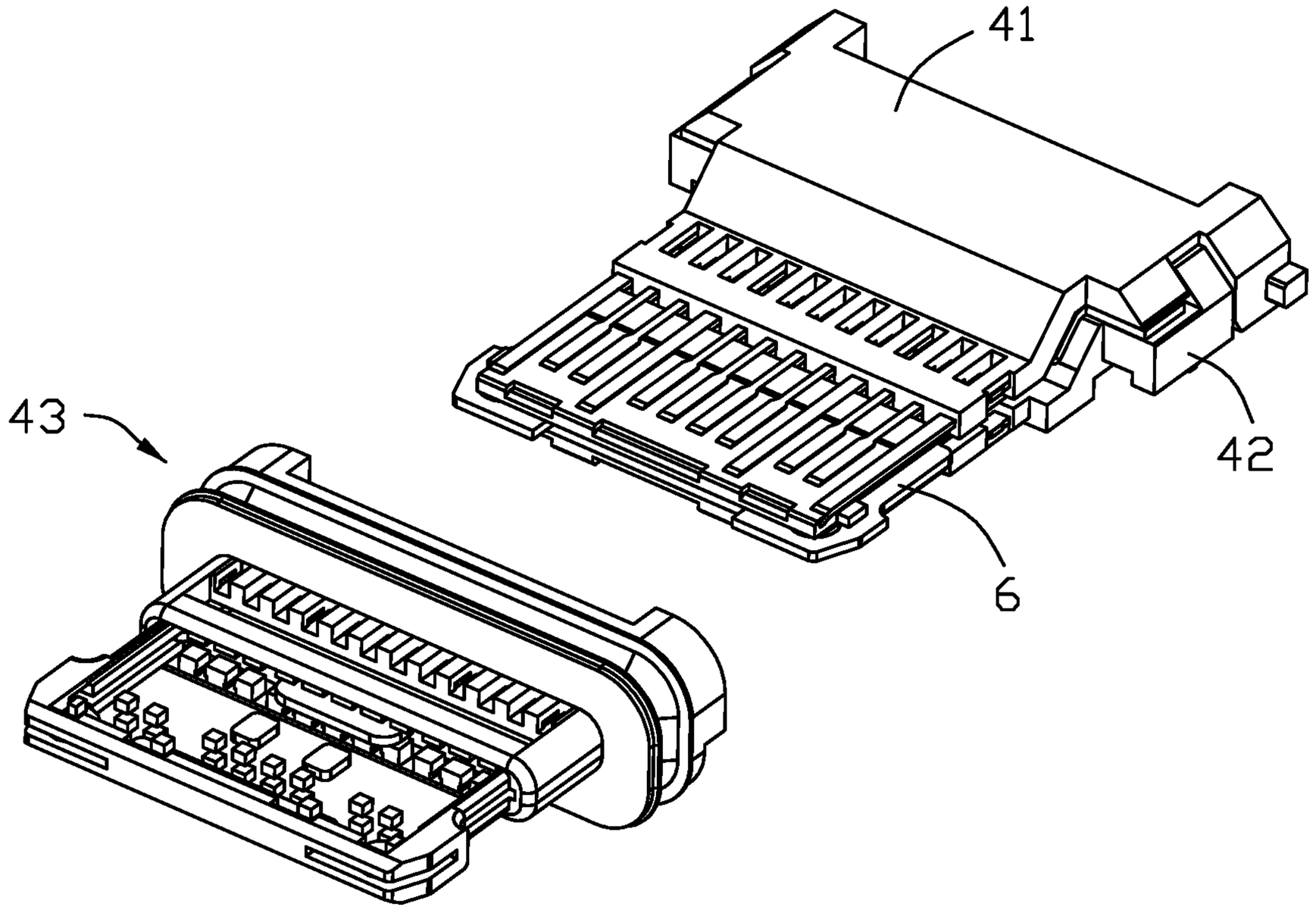

FIG. 7

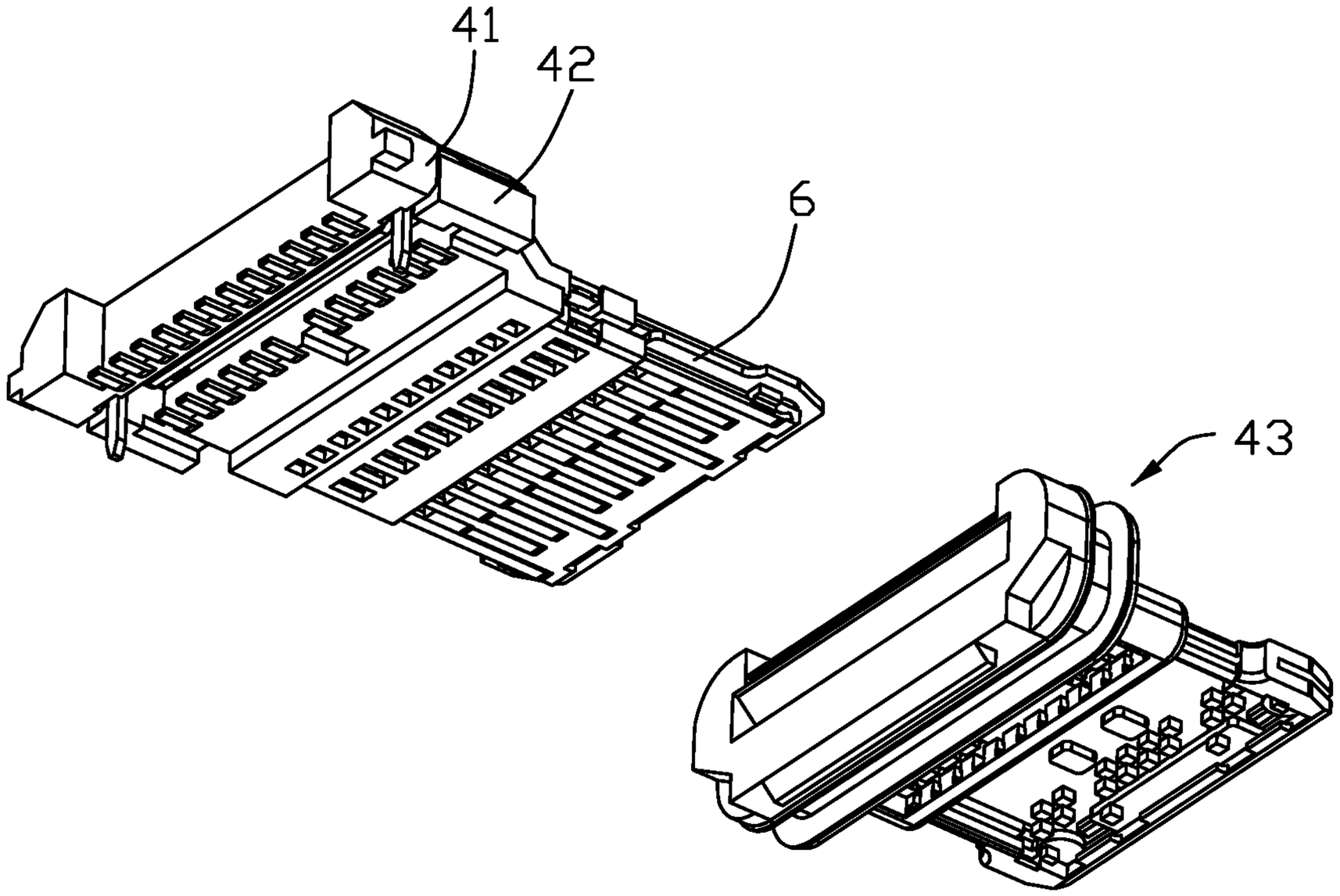

FIG. 8

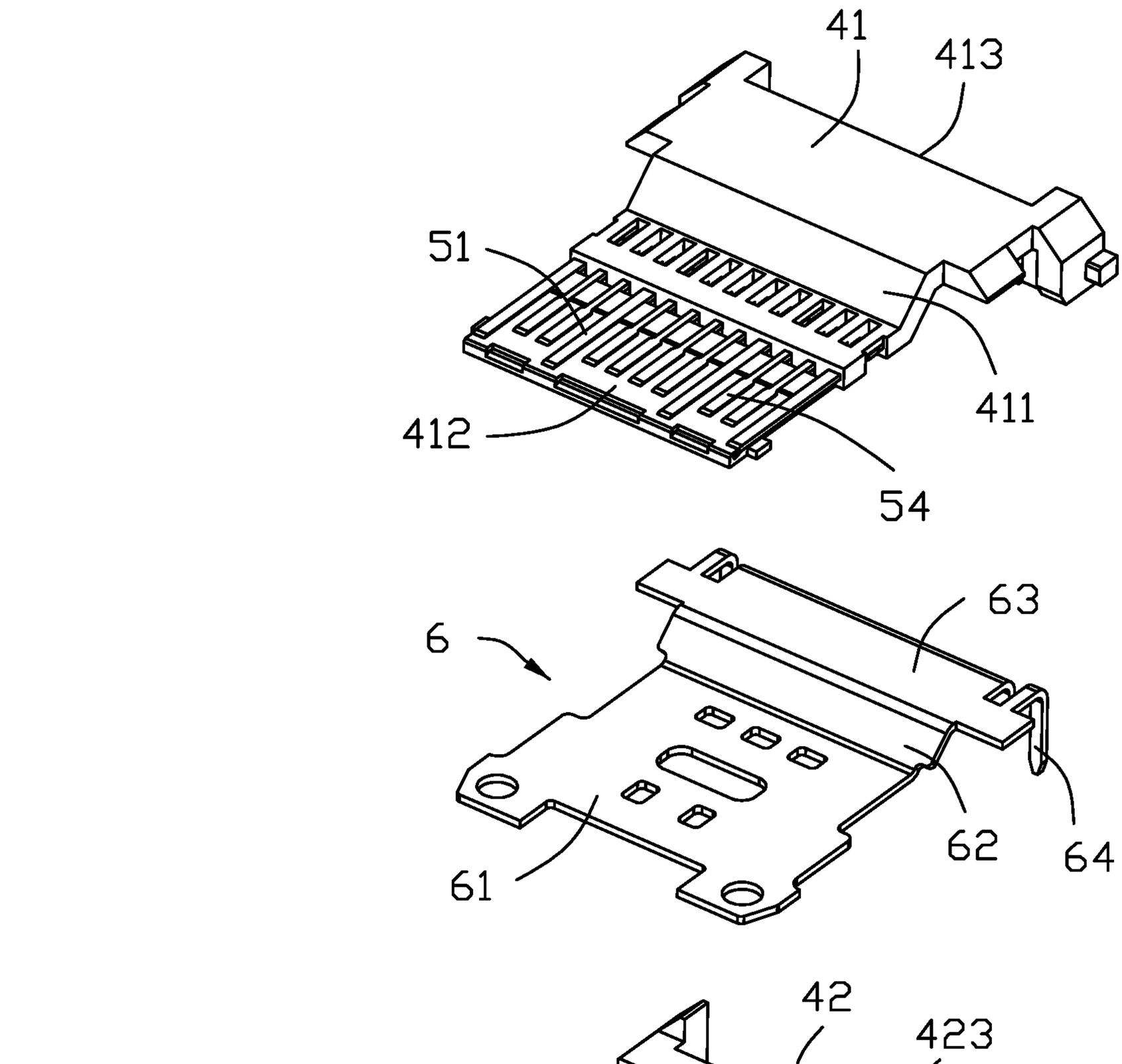
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FIG. 9

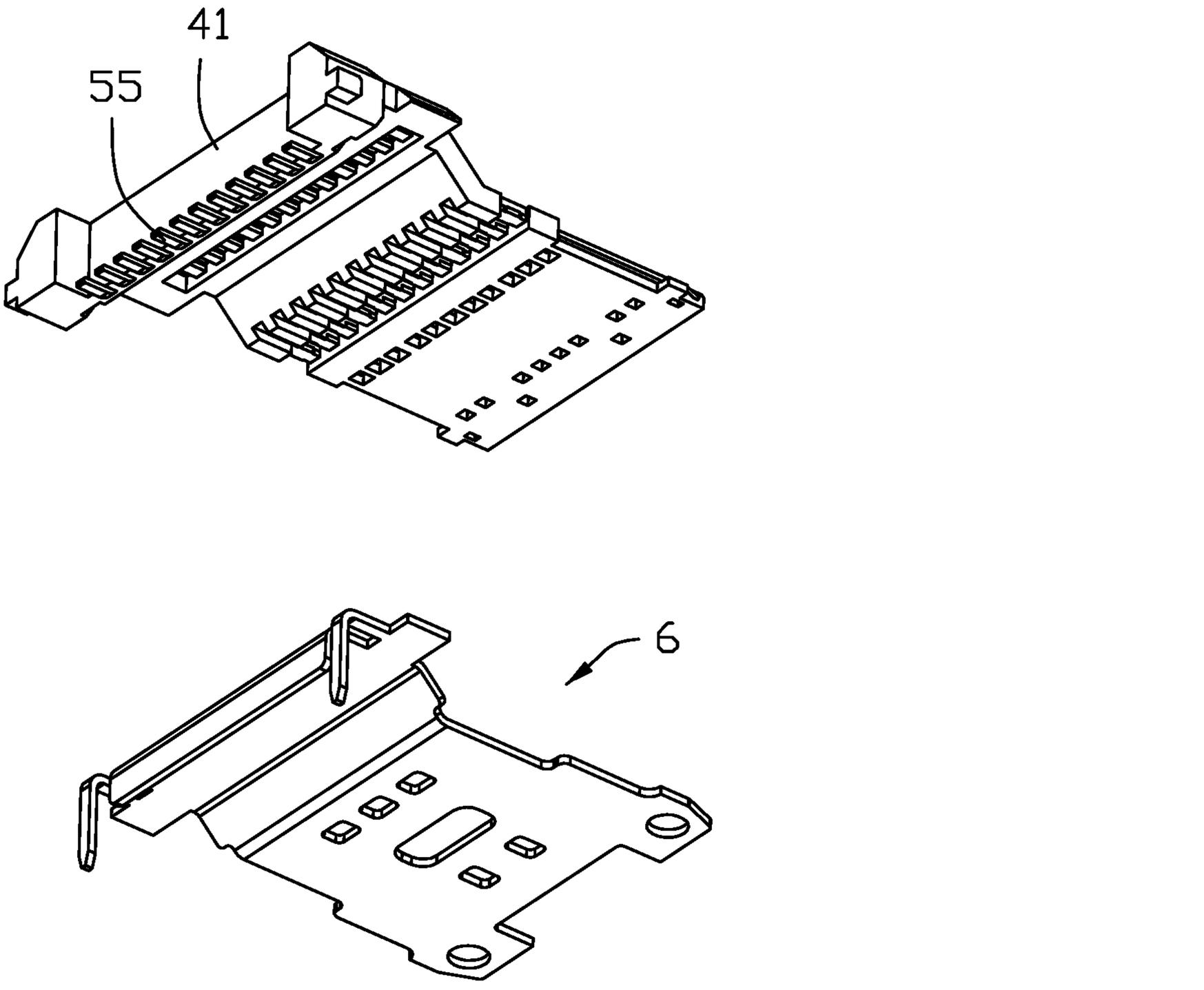

FIG. 10

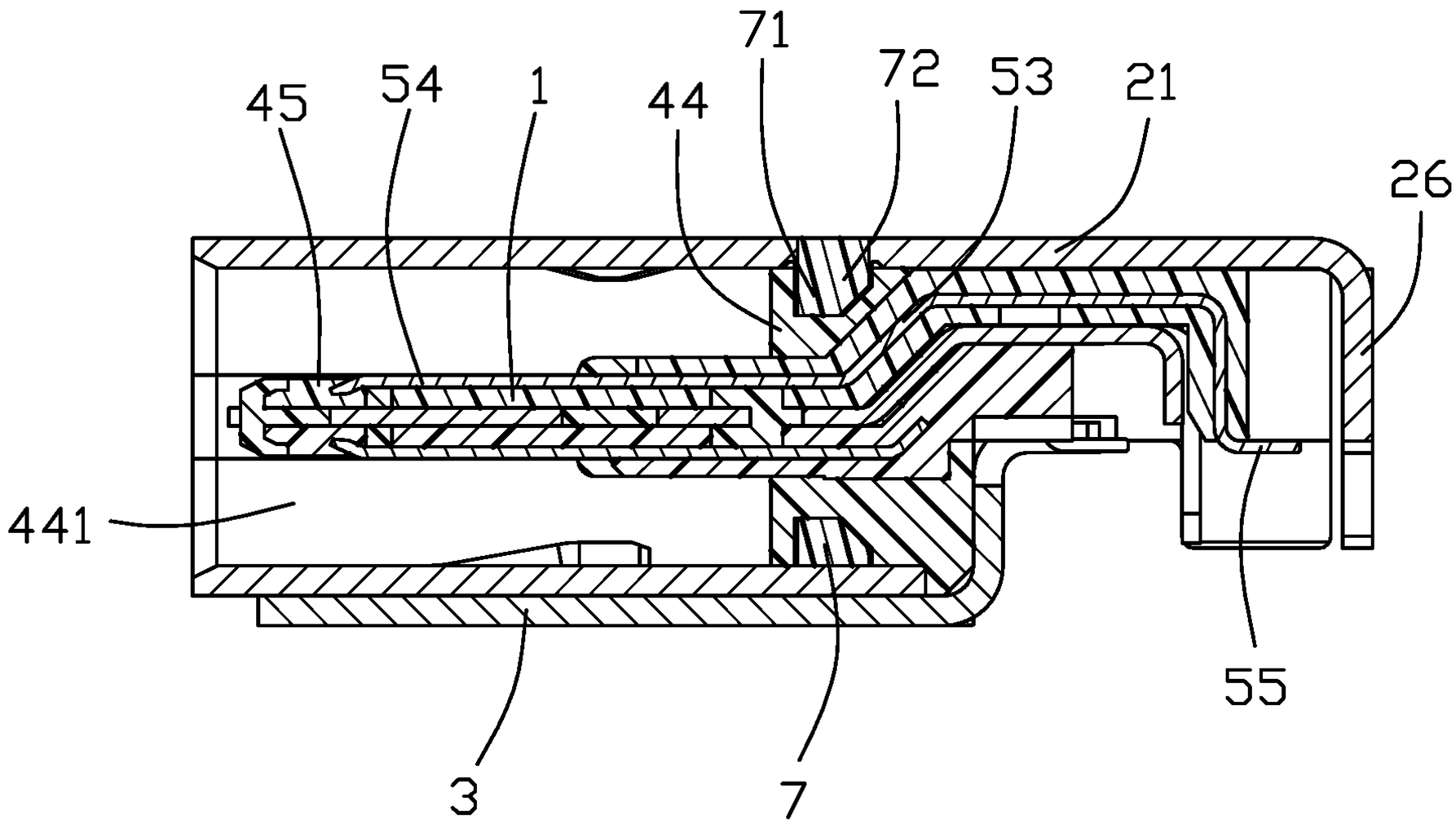

FIG. 11

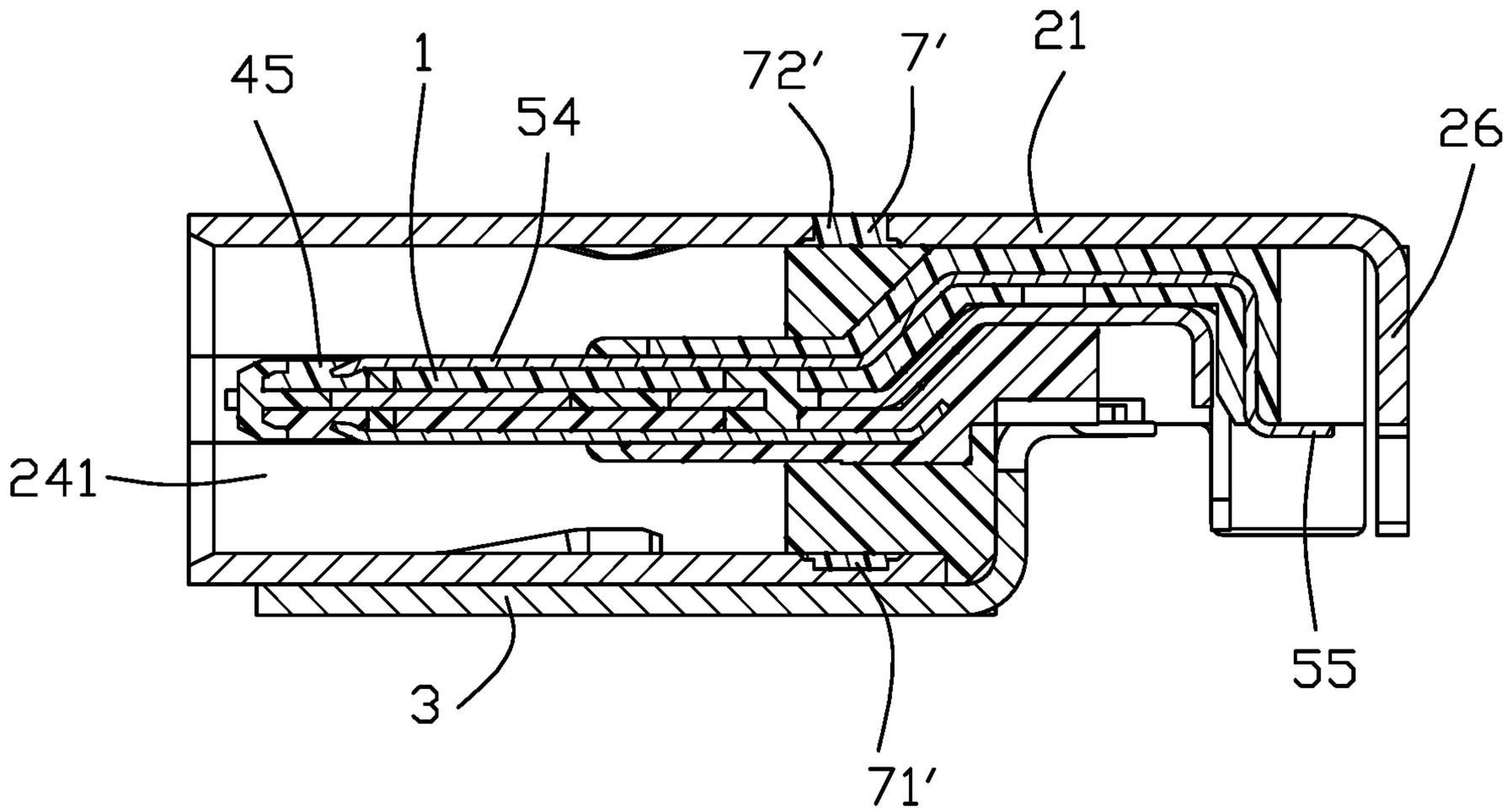

FIG. 12

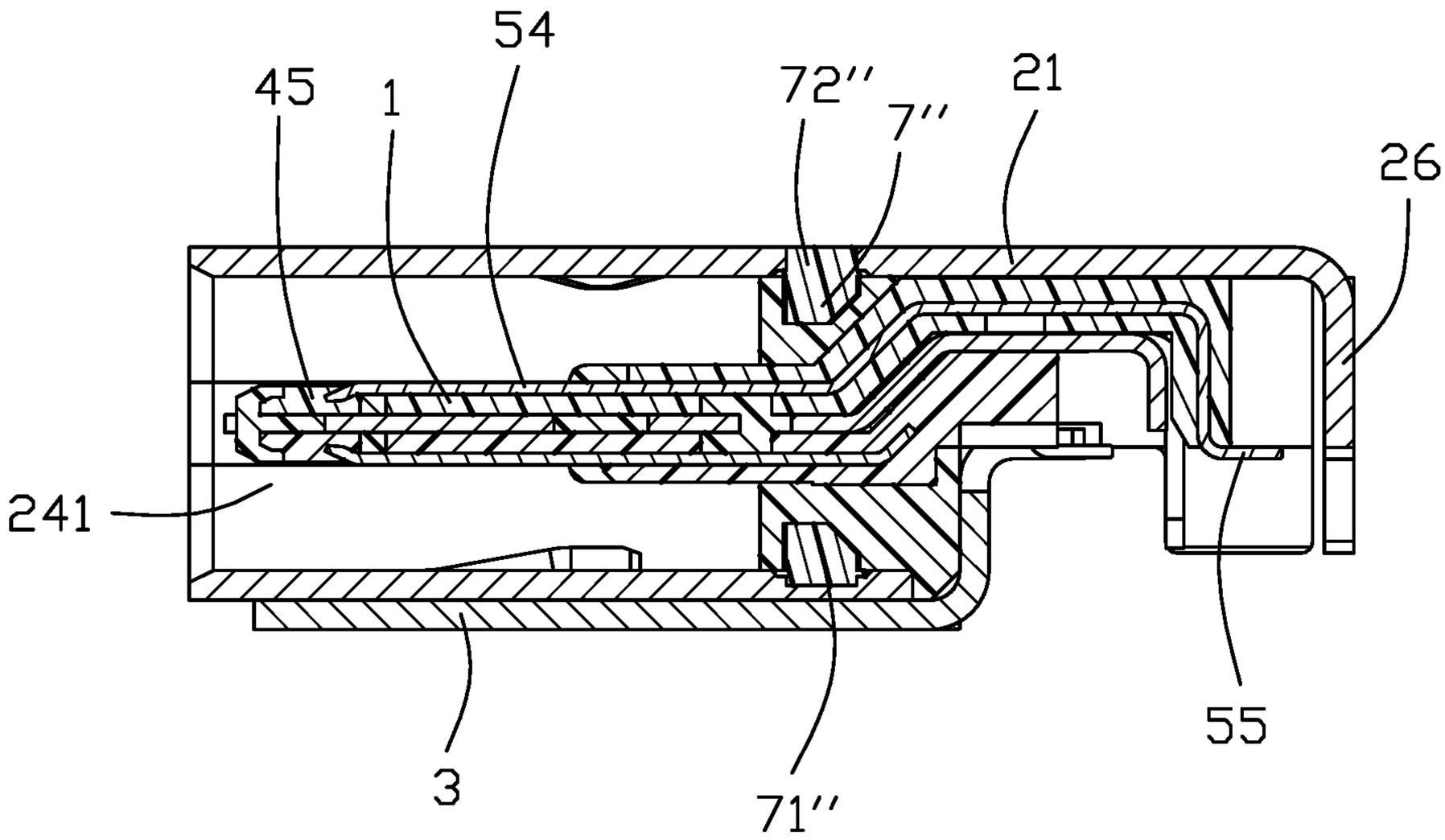

FIG. 13

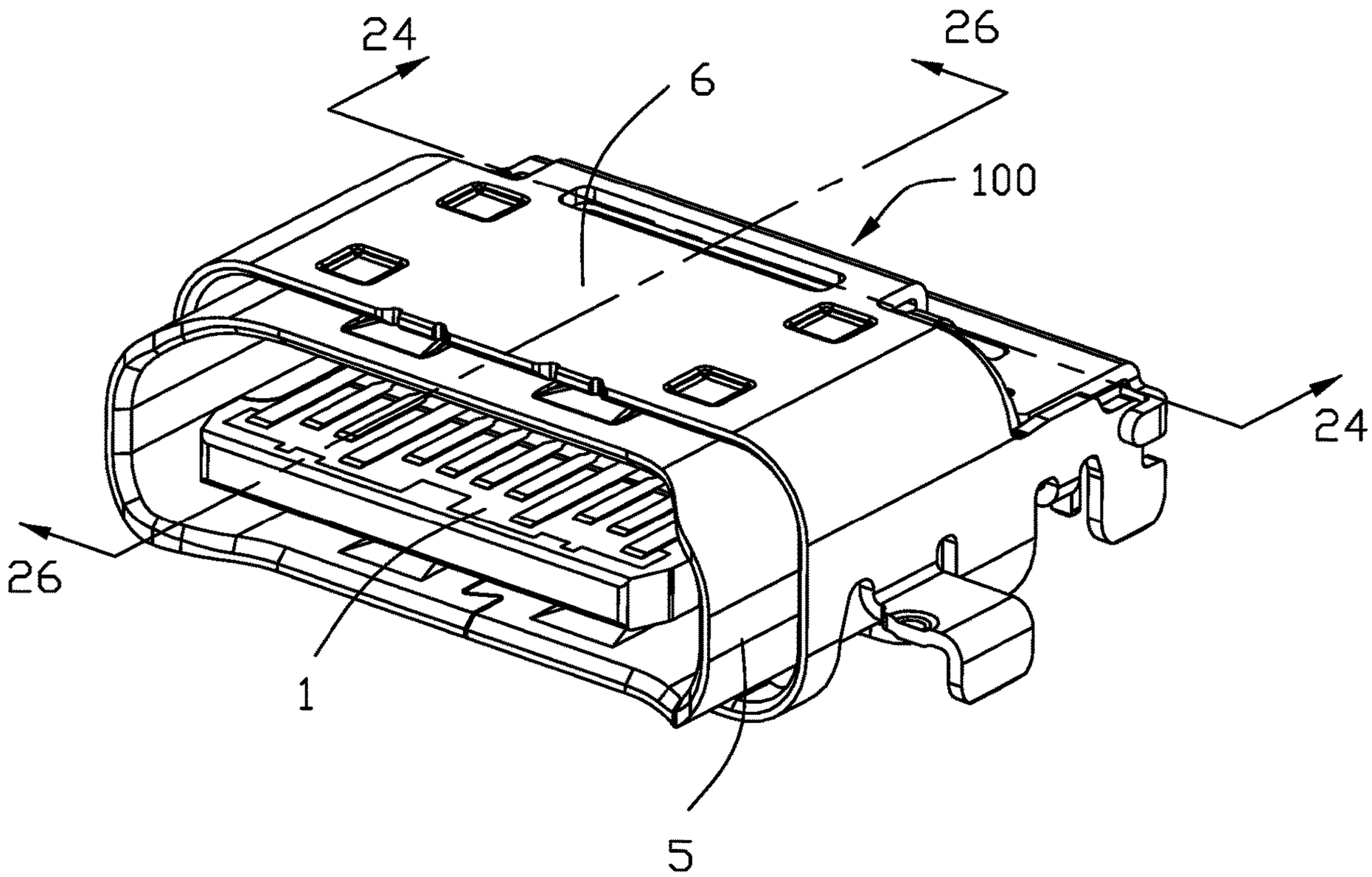

FIG. 14

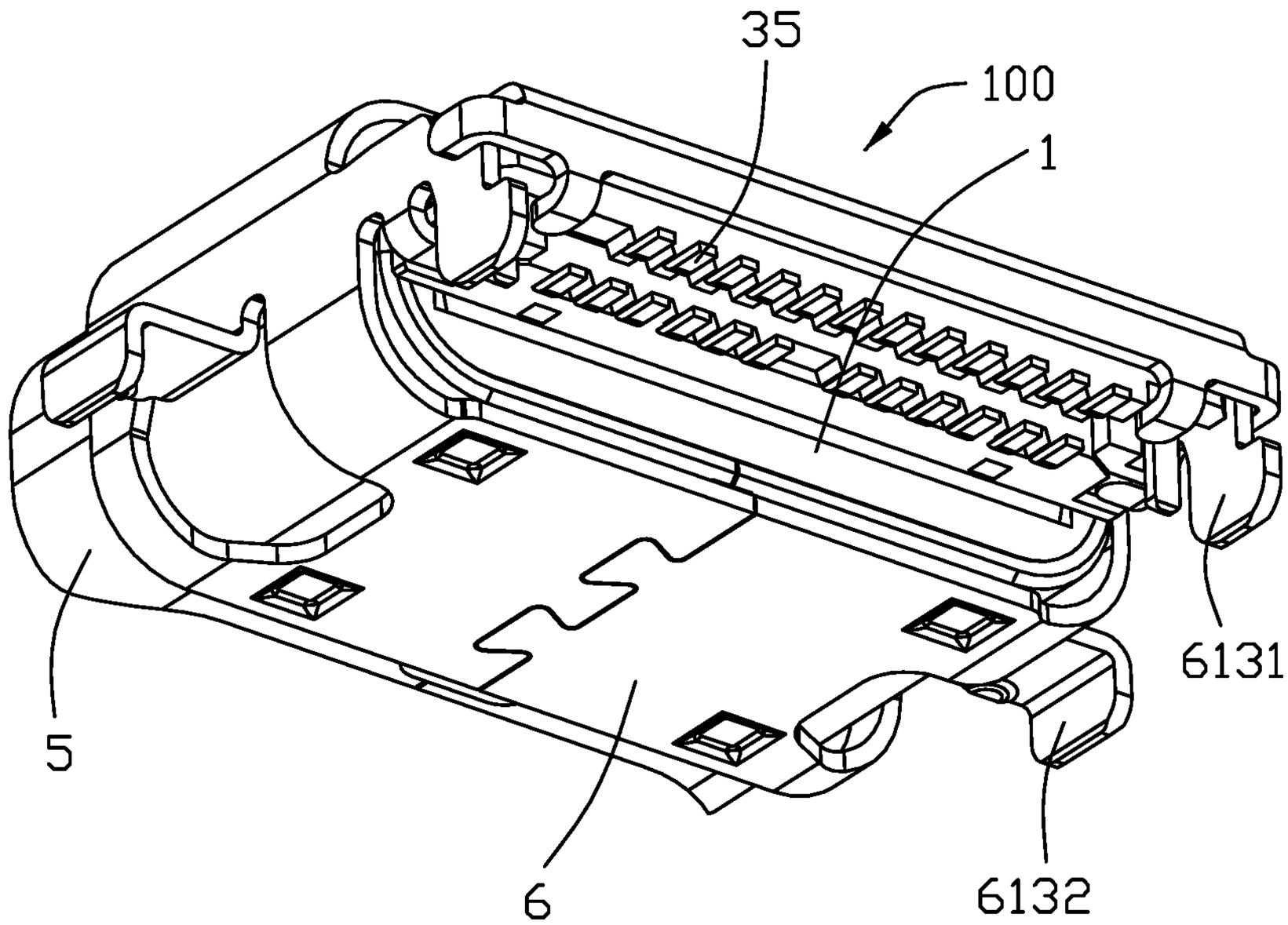

FIG. 15

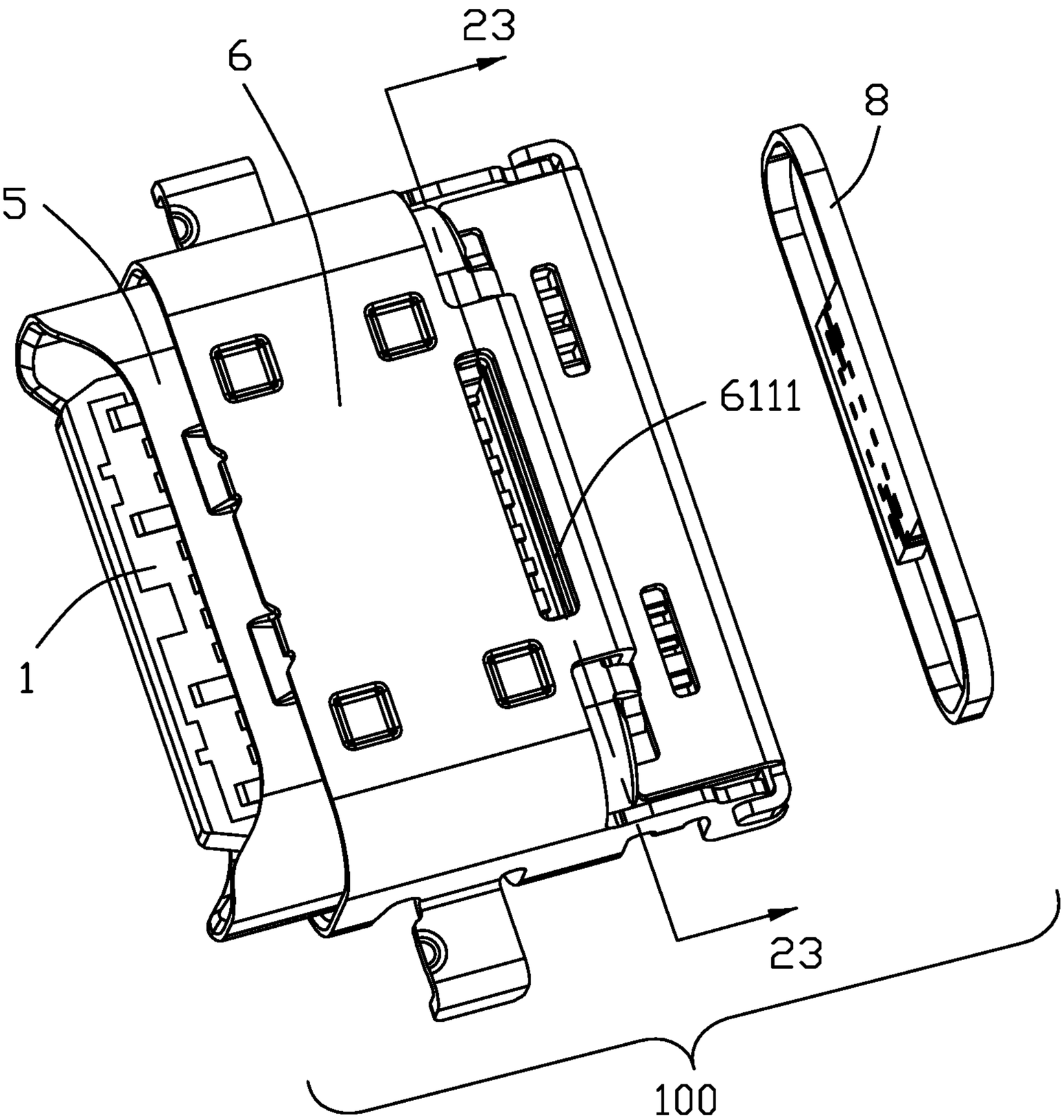

FIG. 16

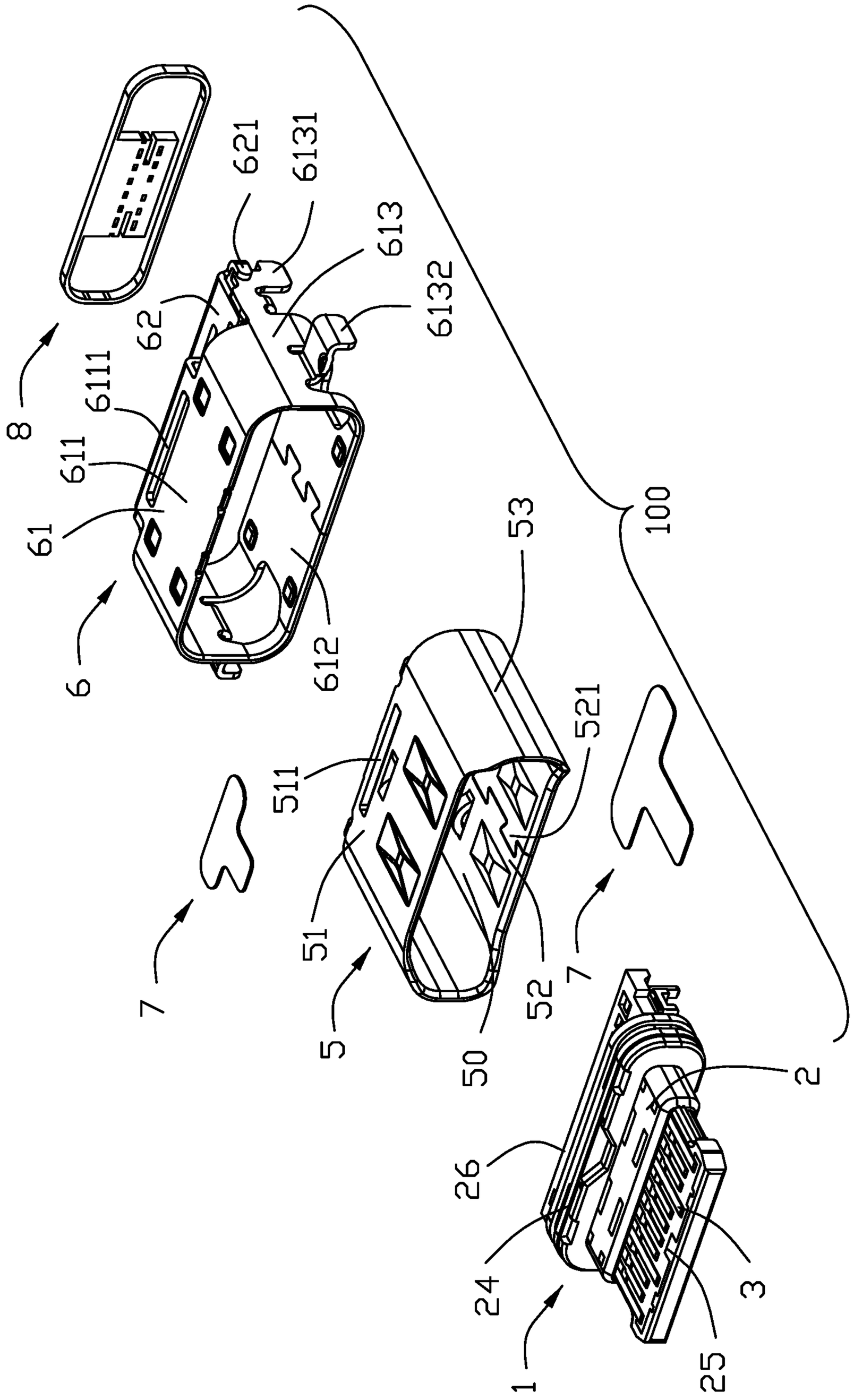
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FIG. 17

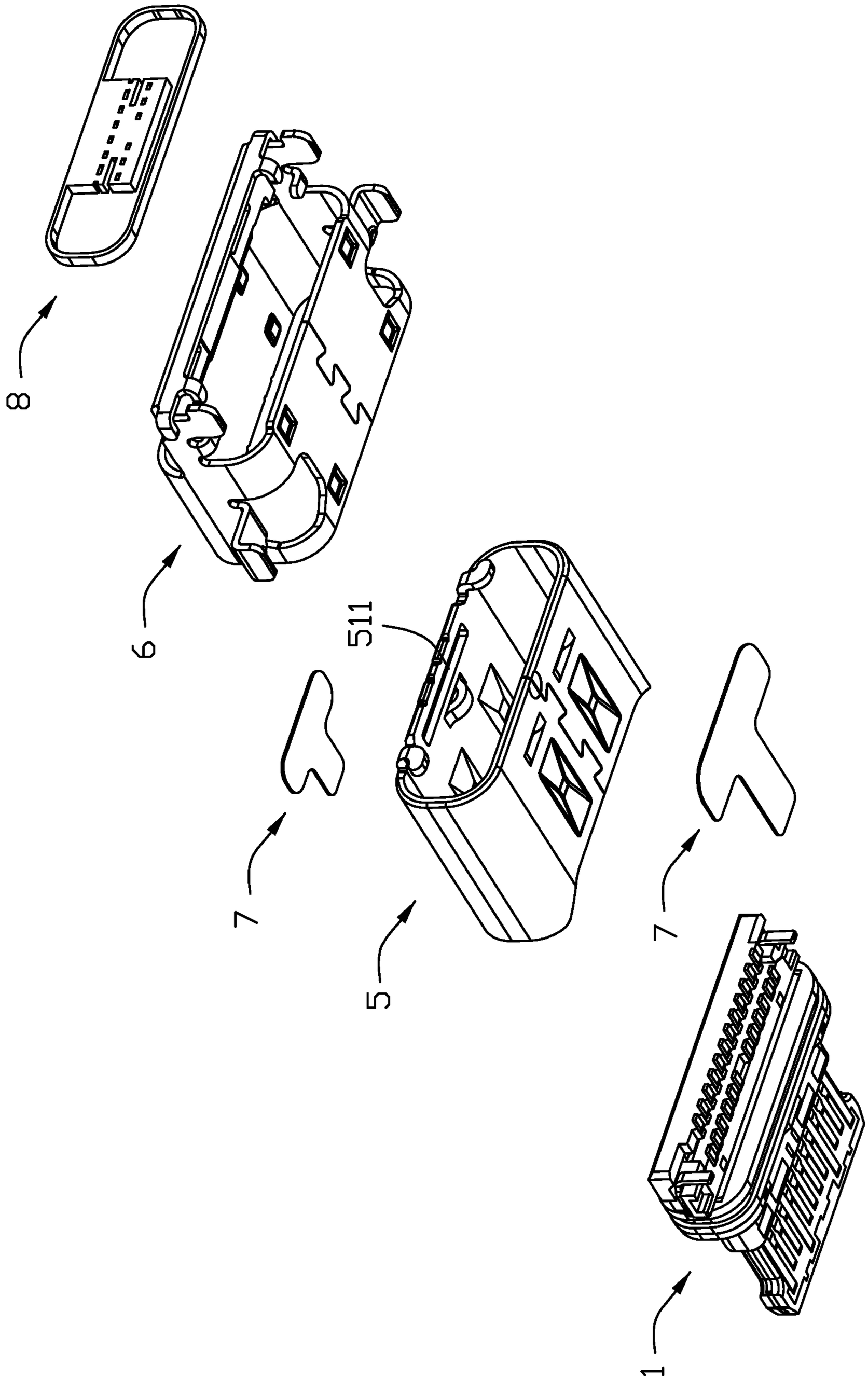

FIG. 18

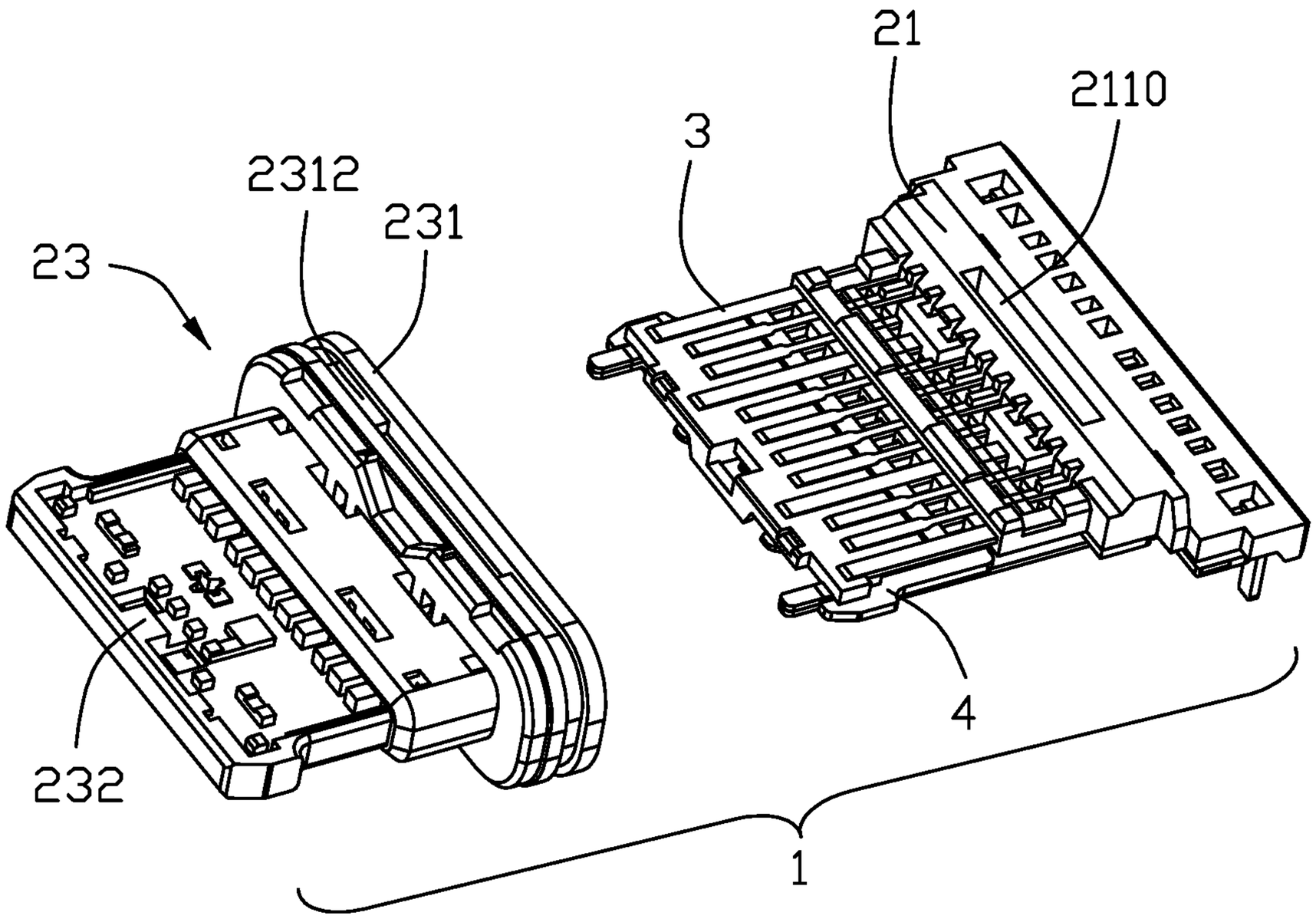

FIG. 19

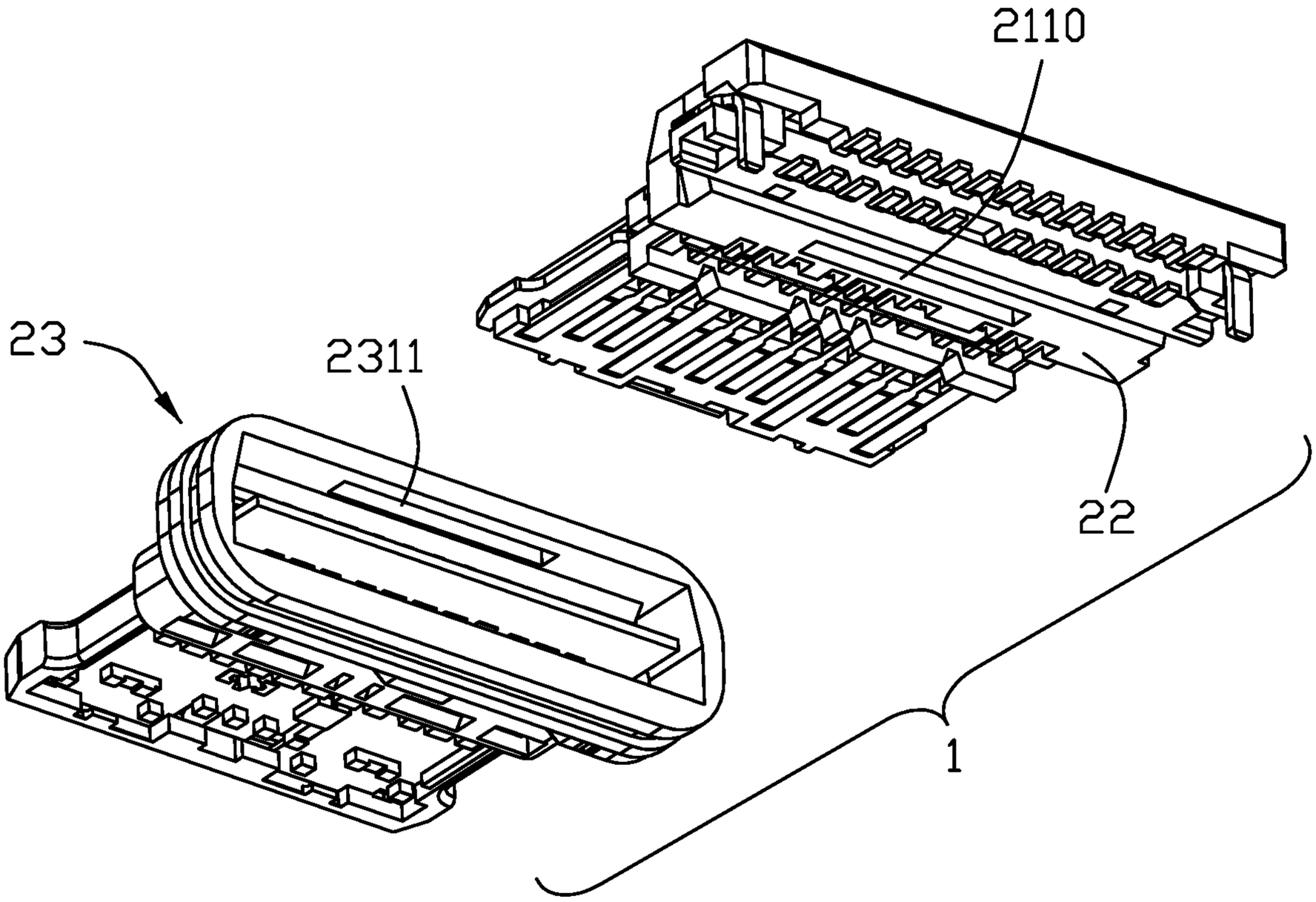

FIG. 20

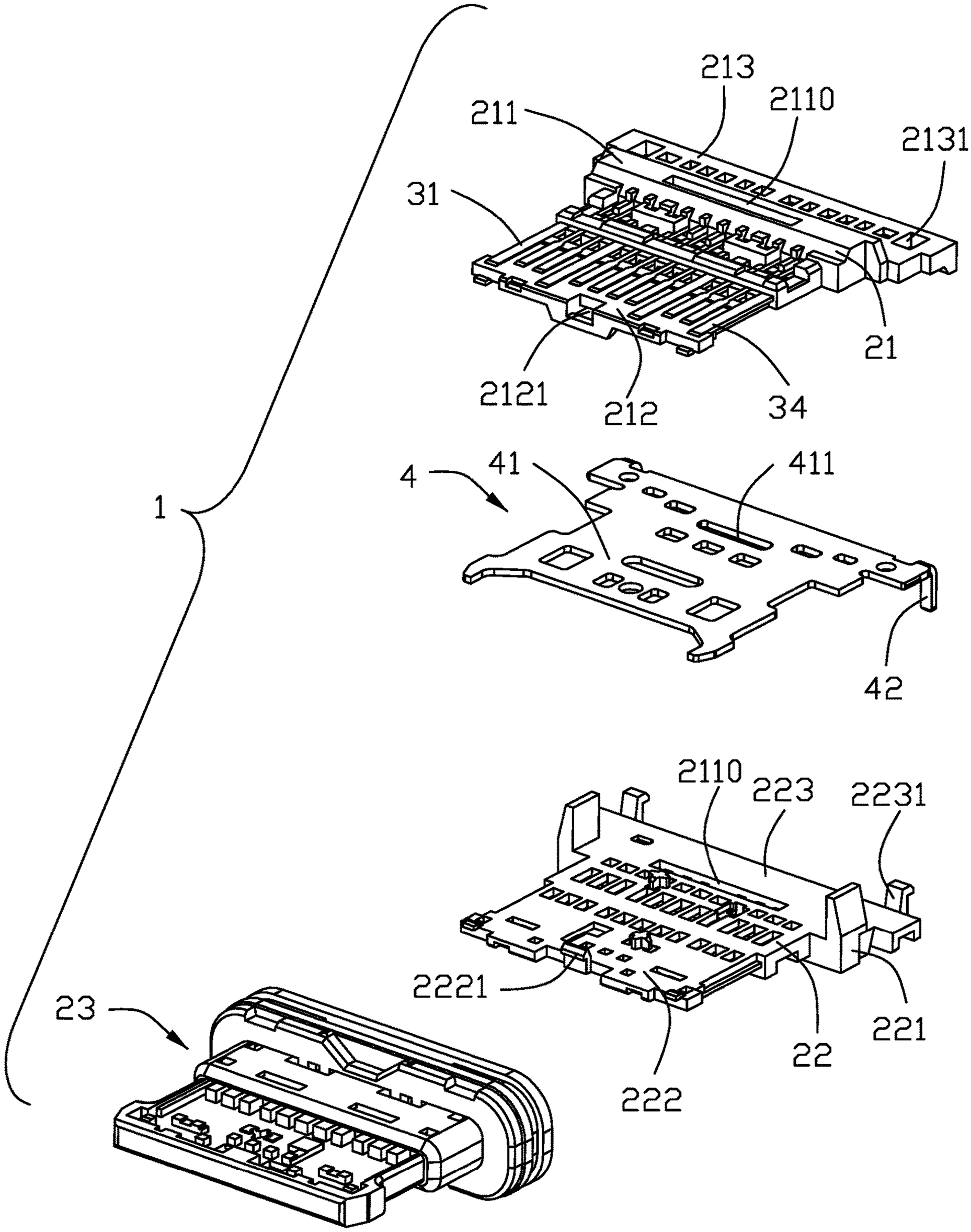
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FIG. 21

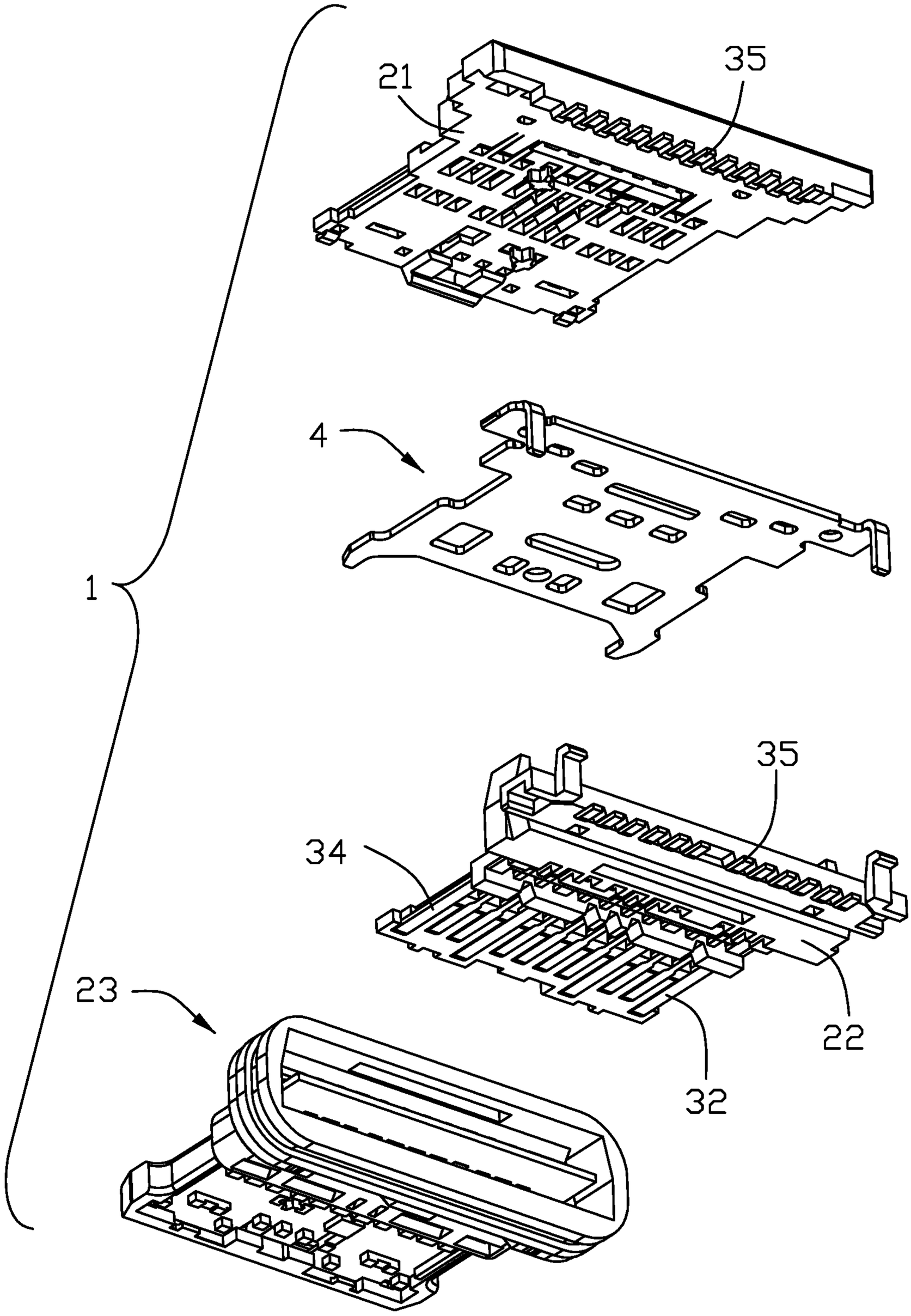

FIG. 22

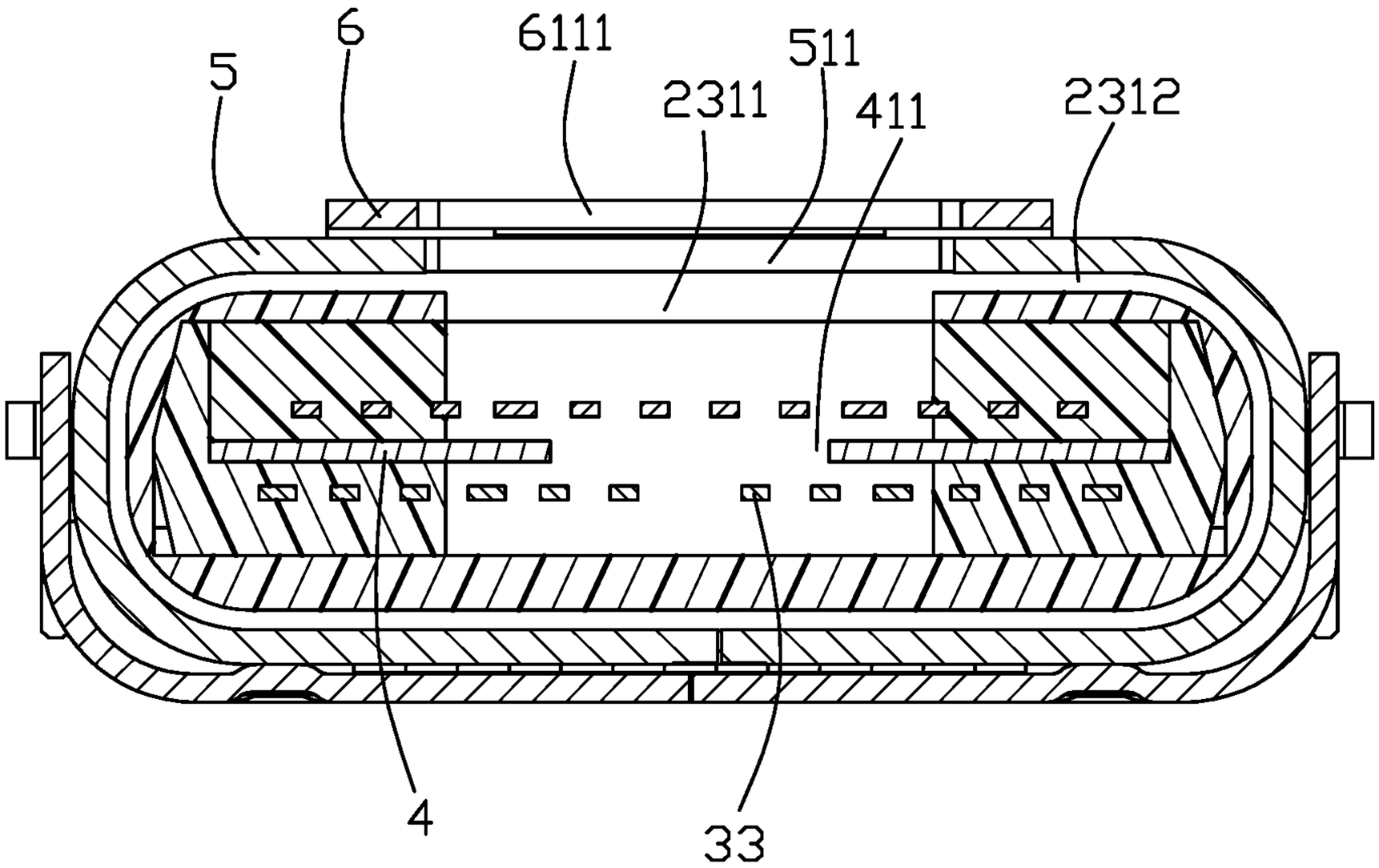

FIG. 23

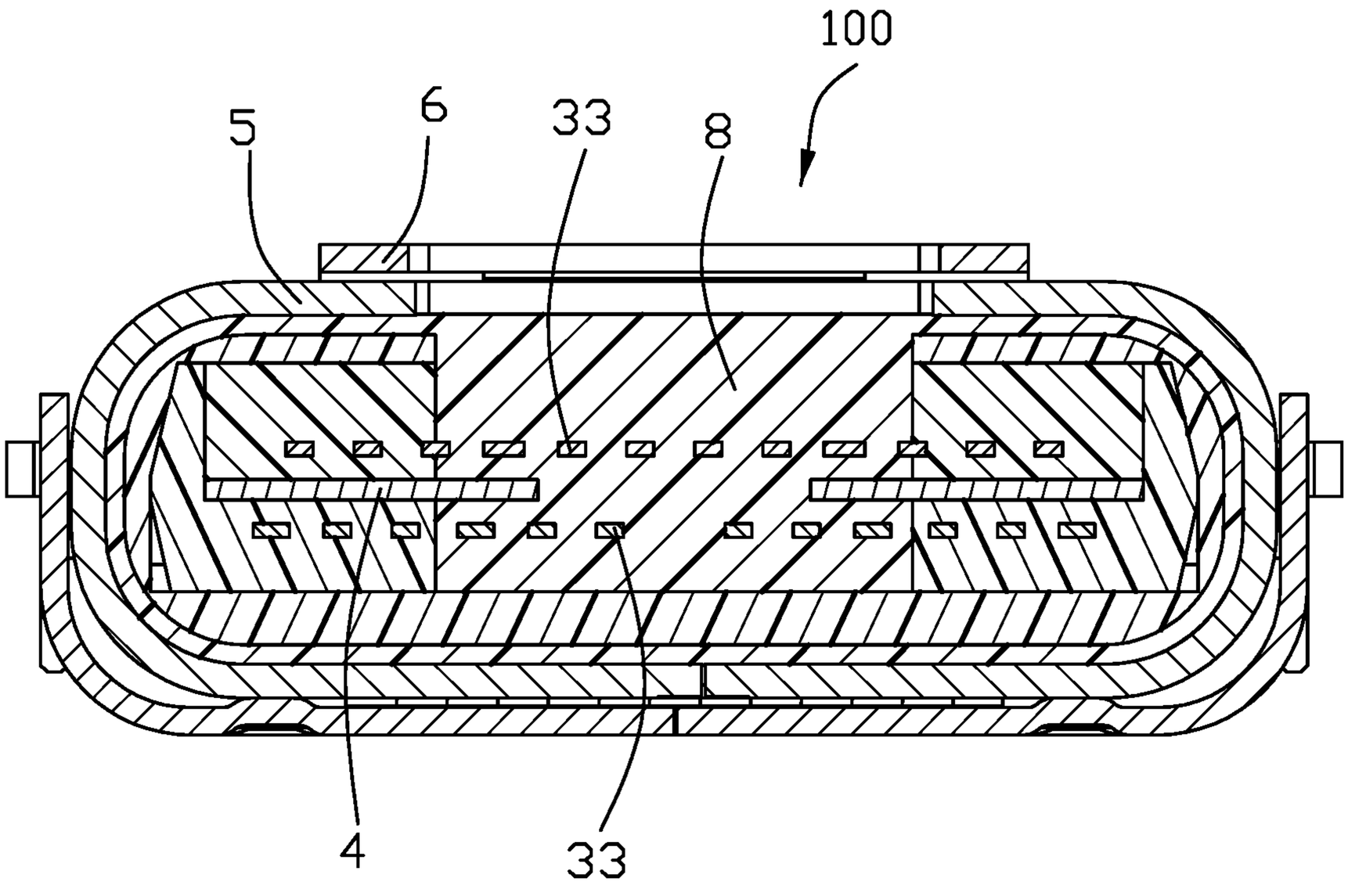

FIG. 24

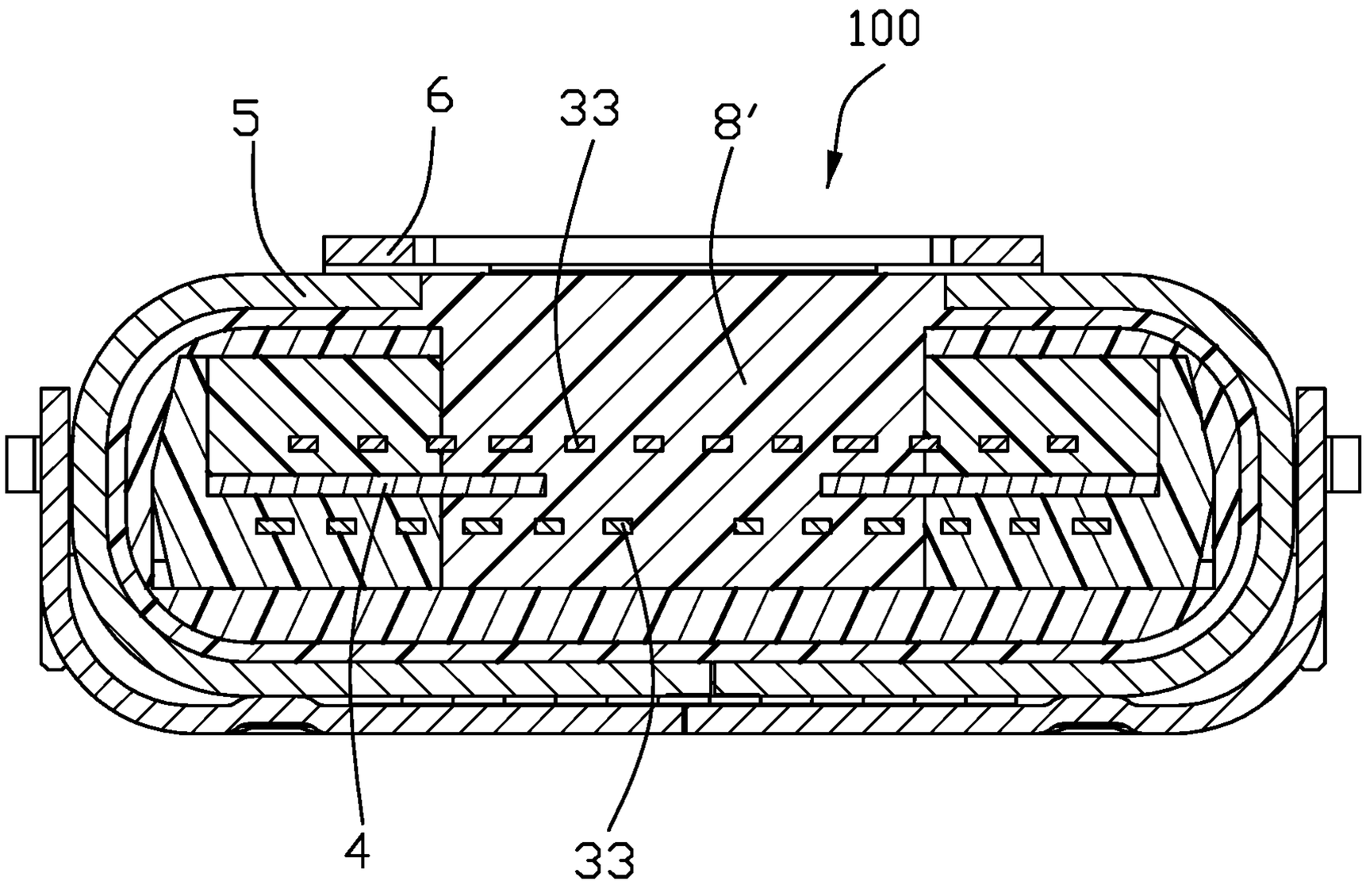

FIG. 25

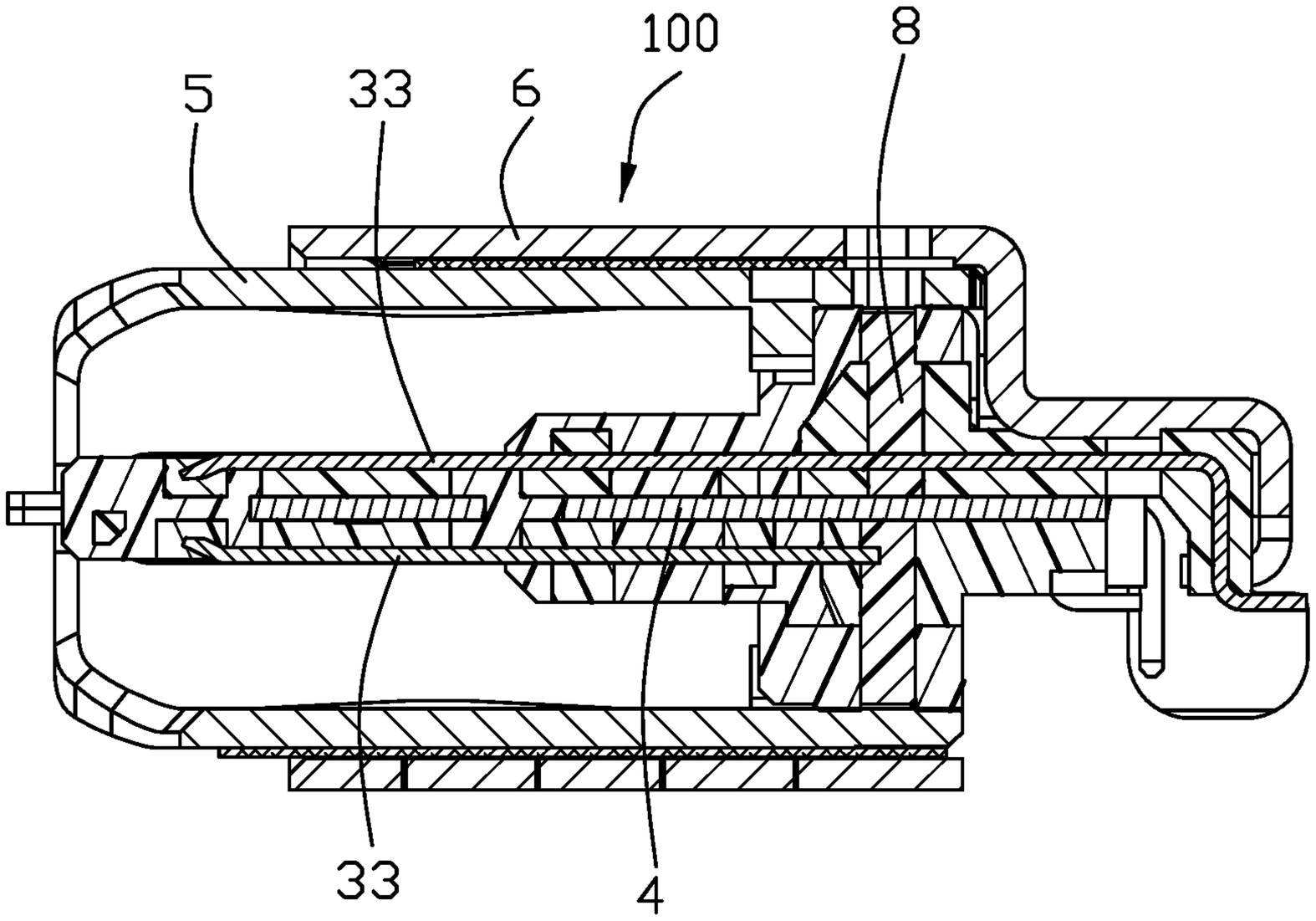

FIG. 26

ELECTRICAL CONNECTOR WITH SEALING MEMBER FORMED AFTER MOUNTING UPON PRINTED CIRCUIT BOARD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to an electrical contact, and more particularly to the electrical connector having a sealing member formed and attached to the connector after the connector is mounted to a print circuit board.

2. Description of Related Arts

China Patent No. CN206471572 having the same applicant and the same inventor with the instant application, discloses a USB (Universal Serial Bus) Type C connector equipped with a sealing ring, which is received within a circumferential groove in the housing, for waterproofing. U.S. Pat. Nos. 9,553,410, 9,774,130 and 9,997,862 having the same applicant and the same inventor with the instant application, disclose the USB Type C connector equipped with a rearwardly exposed waterproofing plate. Anyhow, all existing Type C connectors essentially requisitely have the corresponding waterproofing structures assembled or formed upon the housing thereof before the connector is soldered upon the printed circuit board, thus likely inevitably resulting in potential cracking due to possible bubbles embedded within the preformed waterproofing structure or different thermal expansion coefficients between the metallic shell and the glue structure disadvantageously after the connector is soldered, by heat, upon the printed circuit board.

Hence, an electrical connector mounted upon the printed circuit board and equipped with the waterproofing structure without the potential cracking defect, is desired.

SUMMARY OF THE INVENTION

To achieve the above object, an electrical connector includes a terminal module and a metallic shell receiving the terminal module. The terminal module includes an insulative housing and a plurality of terminals retained in the housing. The housing includes a base intimately enclosed within the shell, and a tongue extending forwardly from the base. The contact includes a front contacting section, a rear soldering section and a middle retaining section therebetween. The base forms in a peripheral surface a circumferential or race course like groove which is isolated from an exterior or outside along a front-to-back direction, and the shell forms an upward opening in a top wall and downwardly communicates with the groove so as to inject the glue into the groove through the opening to form the glue structure only after the connector is soldered upon the printed circuit board for preventing cracking due to bubblers in the glue structure, wherein the glue structure is intimately located between the shell and the housing for superior waterproofing therebetween along the front-to-back direction. In an alternate arrangement, a channel is located between and communicates with at least one of the upper side and the lower side of the race course like groove so as to form an additional vertical plate of the glue structure for enhancing waterproofing between the contacts and the housing in the front-to-back direction.

Other advantages and novel features of the invention will become more apparent from the following detailed description of the present embodiment when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a perspective view of the electrical connector of a first preferred embodiment of the present invention;

FIG. **2** is another perspective view of the electrical connector of FIG. **1**;

FIG. **3** is an exploded perspective view of the electrical connector of FIG. **1**;

FIG. **4** is a further exploded perspective view of the electrical connector of FIG. **3**;

FIG. **5** is another exploded perspective view of the electrical connector of FIG. **4**;

FIG. **6** is a perspective view of the terminal module of the electrical connector of FIG. **1**;

FIG. **7** is an exploded perspective view of the terminal module of the electrical connector of FIG. **6**;

FIG. **8** is another exploded perspective view of the terminal module of the electrical connector of FIG. **7**;

FIG. **9** is a further exploded perspective view of the terminal module of the electrical connector of FIG. **7**.

FIG. **10** is another exploded perspective view of the terminal module of the electrical connector of FIG. **9**;

FIG. **11** is a cross-sectional view of the electrical connector of FIG. **11**;

FIG. **12** is a second cross-sectional view of the electrical connector according to a second embodiment of the invention;

FIG. **13** is a third cross-sectional view of the electrical connector according to a third embodiment of the invention;

FIG. **14** is perspective view of the electrical contact according to a fourth embodiment of the invention;

FIG. **15** is another perspective view of the electrical connector of FIG. **14**;

FIG. **16** is an exploded perspective view of the electrical connector of FIG. **14**;

FIG. **17** is a further exploded perspective view of the electrical connector of FIG. **16**;

FIG. **18** is another exploded perspective view of the electrical connector of FIG. **17**;

FIG. **19** is an exploded perspective view of the terminal module of the electrical connector of FIG. **14**;

FIG. **20** is another exploded perspective view of the terminal module of the electrical connector of FIG. **19**;

FIG. **21** is a further exploded perspective view of the terminal module of FIG. **19**;

FIG. **22** is another exploded perspective view of ht terminal module of FIG. **21**

FIG. **23** is a cross-sectional view of the electrical connector of FIG. **14** without the glue structure thereof;

FIG. **24** is a cross-sectional view of the electrical connector of FIG. **14** with the glue structure thereof;

FIG. **25** is another cross-sectional view of the electrical connector according to a fifth embodiment of the invention; and

FIG. **26** is another cross-sectional view of the electrical connector of FIG. **14** to show the glue structure is isolated from an exterior in the front-to-back direction.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1-11**, an electrical connector **100** for mounting to a printed circuit board (not shown) includes a

terminal module **1**, a metallic shell **2** receiving the terminal module **1**, and a metallic sub-shell **3** attached upon the shell **2**. The terminal module **1** includes an insulative housing **4**, two rows of terminals **5** retained in the housing **4** via an insert-molding process, and a metallic shielding plate **6** between two rows of terminals **5**. The housing **4** includes a first insulator **41** and a second insulator **42** assembled with the first insulator **41**, and a third insulator **43** over-molded upon the assembled first insulator **41** and second insulator **42**. From another viewpoint, the housing **4** includes a base **44**, a tongue **45** forwardly extending from the base **44**, and a mounting section **46** extending rearwardly from the base **44**. The first insulator **41** includes a first base **411**, a first tongue **412** extending forwardly from the first base **411**, and a first mounting section **413** rearwardly extending from the first base **411**. The second insulator **42** includes a second base **421**, a second tongue extending forwardly from the second base **421**, and a second mounting section **423** rearwardly from the second base **421**. The second mounting section **423** forms three receiving slots **424**. The third base **43** includes a third base **431**, a third tongue **432** extending forwardly from the third base **431**. The third base **431** includes a front surface **4311** and a rear surface **4312** opposite to each other in the front-to-back direction, and a circumferential or racecourse like groove **4313** is formed therebetween. In this embodiment, the circumferential groove **4313** refers to the groove **4313** extending with more than 180 degrees relative to 360 degrees circumferentially. A pair of ridges **4314** are formed by two sides of the groove **4313**. A pair of retention slots **4315** are formed in the rear surface **4312**. Understandably, the first base **411**, the second base **421** and the third base **431** commonly form the base **44**, the first tongue **412**, the second tongue **422** and the third tongue **432** commonly form the tongue **45**, and the first mounting section **413** and the second mounting section **423** commonly form the mounting section **46**. The front surface **4311** and the rear surface **4312** of the third base **431** form the corresponding front face **441** and the rear face **442** of the base **44** with the ridges **4314** extend beyond the corresponding peripheral surface **443** of the base **44** in the vertical direction.

The terminals **5** includes a plurality of upper (row) contacts **51** and a plurality of lower (row) contacts **52** wherein the pin assignment of those upper contacts **51** and lower contacts **52** are arranged in a reversely symmetrical manner. Each of the upper row contacts **51** and the lower row contacts **52** has a retaining section **53**, a contacting section **54** extending forwardly from the retaining section **53** for being exposed upon the tongue **45**, and a soldering section **55** extending rearwardly from the retaining section **53** for soldering to the printed circuit board (not shown). The upper row contacts **51** are insert-molded within the first insulator **41**, and the lower row contacts **52** are insert-molded within the second insulator **42**. The contacting section **54** of the upper contacts **51** and those of the lower contacts **52** are respectively exposed upon the corresponding first tongue **412** and second tongue **422**, the retaining section **53** of the upper row contacts **51** and those of the lower row contacts **52** are retained within the first base **411** and the second base **421**, respectively, and the soldering sections **55** of the upper row contacts **51** and those of the lower row contacts **52** are exposed outside of the first mounting section **413** and the second mounting section **423**, respectively.

The shielding plate **6** includes a front section **61**, a middle section **62** and a rear section **63** with mounting legs **64** extending downwardly from the rear section **63**. The shielding plate **6** is sandwiched between the first insulator **41** and the second insulator **42** in the vertical direction, wherein the front section **61** is sandwiched between the first tongue **412** and the second tongue **422**, the middle section **62** is sandwiched between the first base **411** and the second base **421**, and the rear section **63** is sandwiched between the first mounting section **413** and the second mounting section **423**. Understandably, the first insulator **41** with the associated upper contacts **51** cooperates the second insulator **42** to commonly sandwich the shielding plate **6** therebetween in the vertical direction, and all together overmolded by the third insulator **43**.

The shell **2** is metallic and includes four side walls with a receiving space **24** therein. The side walls includes a top wall **21**, a bottom wall **22** and a pair of side walls **23** connected therebetween on two lateral sides. The shell **2** is made by stamping and forming via sheet metal with a riveted seam **221**. The top wall **21** forms an upward injection opening **211**. A downward opening **25** is located behind the bottom all **22** and in front of a rear wall **26** which extends downwardly from a rear edge of the top wall **21** with a pair of mounting legs **261**. The downward opening **25** exposes the soldering sections **55** of the terminals **5**. A pair of pressing sections **231** are formed on the corresponding side walls **23** and extend toward the receiving space **24** and are received within the corresponding retention slots **4315** so as to retain the terminal module **1** with regard to the shell **2**.

The terminal module **1** is received and retained within the receiving space **24** wherein the upward opening **211** is communicatively aligned with the groove **4313** in the vertical direction. The rear wall **26** is initially extends in a horizontal manner to allow the terminal module **1** to be forwardly assembled into the receiving space **24** at the first stage, and successively is bent in a vertical direction after the terminal module **1** is fully received within the receiving space **24** at the second stage for performing superior shielding in the front-to-back direction.

The sub-shell **3** includes a bottom plate **31**, a pair of side plates **32** with corresponding mounting legs **321**, and a rear plate **33** with three mounting legs **331**. The sub-shell **3** is assembled upon the bottom wall **22** and the mounting legs **331** are received within the receiving slots **424**.

The connector **100** further includes a waterproof or glue structure **7** including a ring section **71** received within the groove **4313**, and an engagement section **72** received within the opening **211**. The waterproof structure **7** is formed by injecting fluidal glue into the groove **4313** via the opening **211** after the connector is soldered upon the printed circuit board. Because ridges **4314** interfere with the interior surface of the shell **2**, it is impossible for the fluidal glue to escape from the groove **4313**. The waterproof structure **7** is further intimately attached upon the interior surface of the shell **2**, thus assuring superior waterproofing between the housing **4** and the shell **2** via such a circumferential ring section **71** of the waterproof structure **7**, thus assuring no humidity can penetrate along the front-to-back direction via the gap between the housing **4** and the shell **2**. The engagement section **72** not only prevents relative movement of the waterproof structure **7** along the groove **4313** for self-retentoin, but also reinforces the housing **4** in the shell **2** to resist any improper pushing/rearward force from the complementary mating plug connector along the front-to-back direction. In this embodiment, the waterproof structure **7** completely fills the opening **211** while not invading any recess in the bottom wall **22**, as shown in FIG. **11**.

Referring to FIG. **12**, in the second embodiment the waterproofing structure **7'** of the electrical connector **100'** includes a ring section **71'** and an engagement section **72'**.

Instead of forming the circumferential groove in the housing, the shell **2** forms a tiny circumferential groove **4313'** aligned with the opening **211'** of the shell **2** in the vertical direction. The ridged structures **4314'** formed on the base **44'** are intimately located beside the groove **4313'** for assuring no leakage of the fluidal glue. In other words, the waterproof structure **7'** is only applied upon an exterior surface of the housing **2** rather than embedded within any groove in the housing **2**.

Referring to FIG. **13**, the waterproof structure **7"** includes a ring like section **71"** and an engagement section **72"**. The base **44** includes an inner circumferential groove **43131"** and the shell **2** forms an outer circumferential groove **43132"** aligned with the circumferential groove **43131"** in the vertical direction to commonly form the circumferential groove **4313"** wherein the width of the circumferential groove **43132"** is not larger than the circumferential groove **43131"** in the front-to-back direction. The circumferential groove **43132"** is aligned with the opening **211"**. The ridges **4314"** formed on the base **44**, are intimately received within the circumferential groove **43132"** so as to assure no leakage during injecting the fluidal glue in the front-to-back direction. Notably, in those embodiment, the engagement section **72** of the waterproof structure **7** is fully received within the opening **211**, **211'** and **211"** without excessive upward protrusion thereof even though being upwardly exposed.

Referring to FIGS. **14-24**, the electrical connector **100** includes a terminal module **1** enclosed within a metallic shell unit (not labeled) with waterproof tape **7** and waterproof structure **8**. The shell unit includes a metallic inner shell **5** and a metallic outer shell **6**.

The terminal module **1** includes an insulative housing **2**, a plurality of terminals **3** retained in the housing **2**, and a metallic shielding plate **4**. The insulative housing **2** includes a first insulator **21**, a second insulator **22** assembled to the first insulator **21**, and a third insulator **23** over-molded upon the assembled first insulator **21** and second insulator **22**. From another viewpoint, the housing **2** includes a base **24**, a tongue **25** forwardly extending from the base **24**, and a mounting section **26** rearwardly extending from the base **24**. The first insulator **21** includes a first base **211**, a first tongue **212** extending forwardly from the first base **211**, and a first mounting section **213** rearwardly extending from the first base **211**. The first tongue **212** forms a first retention hole **2121** and the first mounting section **213** forms a pair of second retention holes **2131**. The second insulator **22** includes a second base **221**, a second tongue **222** forwardly extending from the second base **221**, and a second mounting section **223** extending rearwardly from the second base **222**. The second tongue **222** forms a first retention section **2221** engaged within the first retention hole **2121**, and the second mounting section **223** forms a pair of second retention sections **2231** engaged within the first retention holes **2131**. Both the first base **211** and the second base **221** form the first spaces **2110** in the vertical direction. The third insulator **23** forms a third base **231** and a third tongue **232** forwardly extending from the third base **231**. The third base **231** forms a second space **2311** in the vertical direction. A circumferential groove **2312** is formed in a peripheral face of the third base **231**, and the second space **2311** communicates with the circumferential groove **2312**. The first base **211**, the second base **221** and the third base **231** commonly form the base **24**, and the first tongue **212**, the second tongue **222** and the third tongue **232** commonly form the tongue **25**. The first mounting section **213** and the second mounting section **223** commonly form the mounting section **26**. The circumferential groove **2312** is formed in the periphery of the base **24**. The first space **2110** and the second space **2311** are communicatively aligned with each other and further communicates with the upper side of the circumferential groove **2312**.

The terminals **3** include a plurality of upper contacts **31** and a plurality of lower contacts **32** arranged reversely symmetrical with each other. Each of the upper contacts **31** and the lower contacts **32** includes a retaining section **33**, a contacting section **34** forwardly extending from the retaining section **33**, and a soldering section **35** rearwardlye extending from the retaining section **33**. The upper contacts **31** are integrally formed within the first insulator **21** via insert-molding as well as the lower contacts **32** are integrally formed within the second insulator **22**. The contacting sections **33** are exposed upon the first tongue **212** and the second tongue **222**. The retaining sections **33** are retained in the first base **211** and the second base **221** and exposed in the first space **2110**, and the soldering sections **35** are exposed outside of the first mounting section **213** and the second mounting section **223**.

The shielding plate **4** includes a plate section **41** and a pair of mounting legs **42**. The plate section **41** forms an through hole **411**. The shielding plate **4** is sandwiched between the first insulator **21** and the second insulator **22** in the vertical direction. The through hole **411** is communicatively aligned with the first space **2110** as explained later.

The third insulator **23** is over-molded upon the assembled first insulator **21** and second insulator **22** with the shielding plate **4** therebetween in the vertical direction.

The inner shell **5** includes a top wall **51**, a bottom wall **52** opposite to the top wall **51** in the vertical direction, and a pair of side walls **53** connected therebetween in the vertical direction. The shell **5** is made by stamping and forming with a riveted seam **521**. The top wall **51** forms a (first) injection opening **511** communicatively aligned with the circumferential groove **2312** in the vertical direction. The waterproof tapes **7** are attached upon the top wall **51** and the bottom wall **52** for covering the slits (not labeled) due to forming inward protrusions (not labeled) from the top wall **51** and the bottom wall **52** for stopping forward movement of the housing **2** with regard to the shell **5**. The outer shell **6** is made of metal and includes a tubular main body **61** and the rear covering section **62**. The main body **61** includes a top late **611** and a bottom plate **612** opposite to the top plate **611** in the vertical direction, and a pair of side plates **613** connected therebetween in the vertical direction. Each side plate **613** forms a mounting leg **6131** and a securing leg **6132**. The cover section **62** forms a pair of hooks **621**. The top plate **611** forms a (second) injection opening **6111** communicatively aligned with the first injection opening **511** in the vertical direction.

The connector **100** without the glue structure **8** is firstly soldered upon the printed circuit board. The fluidal glue is successively injected into the first space **2110** via the second injection opening **6111**, the first injection opening **511** and the second space **2311**. Once the first space **2110** is filled up, and the glue further fills the circumferential groove **2312** and the second space **2311** sequentially. The first injection opening **511** can be also optimally filled with the glue/waterproof structure as shown in FIG. **25**. Understandably, the glue structure **8** fills the first space **2110** may enhance waterproofing between the contacts and the housing in the front-to-back direction while that fills the circumferential groove **2312** may enhance waterproofing between the shell and the housing in the front-to-back direction.

In conclusion, the invention essentially provides in the housing a circumferential groove isolated from the exterior

in the front-to-back direction while equipped with an upward opening formed in the shell and communicatively aligned with the circumferential groove in the vertical direction so as to have the waterproofing glue filled within the circumferential groove via the injection opening after the connector is soldered upon the printed circuit board without potential cracking defect due to overheat situation derived from the soldering environment.

Although the present invention has been described with reference to particular embodiments, it is not to be construed as being limited thereto. Various alterations and modifications can be made to the embodiments without in any way departing from the scope or spirit of the present invention as defined in the appended claims.

What is claimed is:

1. An electrical connector for soldering to a printed circuit board, comprising:

a terminal module including an insulative housing and a plurality of contacts retained integrally therein via an insert-molding process, the housing including a base and a tongue forwardly extending from a front portion of the base in a front-to-back direction;

each of said contacts including a front contacting section exposed upon the tongue and a rear soldering section exposed outside of the housing;

a metallic shell enclosing the terminal module and intimately surrounding the base;

an upward injection opening formed in a top wall of the metallic shell; and

a circumferential groove formed in a peripheral surface radially contacting an interior surface of the shell, and being isolated from an outside in said front-to-back direction; wherein

the injection opening is communicatively aligned with the circumferential groove so that the circumferential groove communicates with the outside only via said injection opening; wherein

after the soldering sections of the contacts are soldered to the printed circuit board, a fluidal type waterproofing glue is initially injected into the circumferential groove via the injection opening and successively solidified so as to avoid cracking due to soldering; wherein

said injection opening is forwardly distanced from a rear end of the top wall, and is located at a position vertically aligned with said front portion of the base.

2. The electrical connector as claimed in claim **1**, wherein the waterproofing glue fills the injection opening to form an engagement section so as to prevent relative movement of the waterproofing glue along the circumferential groove.

3. The electrical connector as claimed in claim **1**, wherein the housing forms, along a vertical direction perpendicular to the front-to-back direction, a vertical space communicating with the circumferential groove along said vertical direction, and the contacts are exposed in the space, so that the waterproofing glue fills the space to form a vertical plate through which the contacts extend along the front-to-back direction.

4. The electrical connector as claimed in claim **3**, further including a metallic shielding plate between two rows of said contacts in said vertical direction, and said shielding plate forms another space aligned with the vertical space of the housing in the vertical direction and filled by said vertical plate.

5. The electrical connector as claimed in claim **1**, wherein the housing forms a pair of ridges by two sides of the circumferential groove so as to enhance isolation of the circumferential groove in the front-to-back direction.

6. The electrical connector as claimed in claim **1**, wherein the injection opening is formed in only the top wall of the shell.

7. A method of making an electrical connector comprising steps of:

providing a terminal module with an insulative housing and a plurality of terminals integrally formed with the housing via insert-molding, said housing including a base and a tongue extending forwardly from the base, each of said contacts including, along a front-to-back direction, a front contacting section exposed upon the tongue and a rear soldering section exposed outside of the housing;

forming a circumferential groove in a peripheral surface of the base, said circumferential groove being isolated from an outside in the front-to-back direction;

inserting the terminal module into a metallic tubular shell wherein the peripheral surface of the base intimately contacting radially an interior surface of the shell, and a top wall of the shell forms an upward injection opening communicatively aligned with the circumferential groove in a vertical direction perpendicular to the front-to-back direction;

securing the soldering sections of the contacts to a printed circuit board via soldering; and

downwardly injecting fluidal waterproofing glue, along the vertical direction, into the circumferential groove via said injection opening to fill up said circumferential groove after the connector is mounted upon the printed circuit board and when both the connector and the printed circuit board are positioned horizontally.

8. The method as claimed in claim **7**, wherein the injection opening is filled with said waterproofing glue to form an engagement section.

9. The method as claimed in claim **7**, wherein said housing forms a vertical space communicating with the circumferential groove and filled with the waterproofing glue to form a glue plate through which the contacts extend in the front-to-back direction.

10. The method as claimed in claim **9**, wherein the connector further includes a metallic shielding plate located between two rows of said contacts in the vertical direction, and said shielding plate forms a space communicating with said vertical space in the vertical direction and filled with the waterproofing glue.

11. The method as claimed in claim **7**, wherein the shell forms another circumferential groove facing said circumferential groove correspondingly with the waterproofing glue filled therein as well.

12. An electrical connector for soldering to a printed circuit board, comprising:

a terminal module including an insulative housing and a plurality of contacts retained integrally therein via an insert-molding process, the housing including a base and a tongue forwardly extending from the base in a front-to-back direction;

each of said contacts including a front contacting section exposed upon the tongue and a rear soldering section exposed outside of the housing;

a metallic shell enclosing the terminal module and intimately surrounding the base;

an upward injection opening formed in a top wall of the metallic shell; and

a circumferential groove formed in an interface area of the base and the shell and being isolated from an outside in said front-to-back direction; wherein

the injection opening is communicatively aligned with the circumferential groove in a vertical direction perpendicular to the front-to-back direction, so that the circumferential groove communicates with the outside only via said injection opening; wherein

after the soldering sections of the contacts are soldered to the printed circuit board, a fluidal type waterproofing glue is initially injected downwardly into the circumferential groove via the injection opening under a situation that both the printed circuit board and the connector are positioned horizontally, and successively solidified so as to avoid cracking due to soldering.

13. The electrical connector as claimed in claim **12**, wherein said circumferential groove is formed in at least an peripheral surface of the base.

14. The electrical connector as claimed in claim **12**, wherein said circumferential groove is formed in at least an interior surface of the shell.

15. The electrical connector as claimed in claim **12**, wherein the housing forms a vertical space communicating with the circumferential groove and filled with the waterproofing glue to form a vertical plate through which the contacts extend in the front-to-back direction.

16. The electrical connector as claimed in claim **15**, further including a metallic shielding plate located between two rows of said contacts, wherein said shielding plate forms a space communicating with the vertical space in the vertical direction and filled with the waterproofing glue.

17. The electrical connector as claimed in claim **12**, wherein the injection opening is filled with the waterproofing glue to form an engagement section.

18. The electrical connector as claimed in claim **12**, wherein the circumferentially groove extends with 360 degrees circumferentially.

19. The electrical connector as claimed in claim **12**, wherein a pair of ridged structures are located by two sides of the circumferential groove so as to strictly prevent the glue from escaping from the circumferential groove.

20. The electrical connector as claimed in claim **12**, wherein the injection opening is formed in only the top wall of the shell.

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